

THE UNIVERSITY OF KANSAS SCIENCE BULLETIN

VOL. XXIX, pt. I]

JULY 15, 1943

[No. 1

A Revision of Nearctic DORILAIIDAE (PIPUNCULIDAE)*

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ABSTRACT: A monographic study of all of the known Nearctic species of the Dipterous family DORILAIIDAE, bringing up to date the taxonomy and known data concerning these flies. Containing keys to the subfamilies, genera and subgenera of the world and keys to the species of Nearctic genera, with eighteen plates and 464 figures illustrating the important taxonomic and morphological characters. Fourteen world genera and one subgenus are described; one genus is described as new; one hundred and seventeen species, subspecies and varieties are discussed, twenty-seven are described as new. The new genus, species, nomenclatorial changes, new synonymy and combinations are as follows: New genus: *Allomethus* (genotype *Allomethus brimleyi* n. sp.) New species: *Chalarus latifrons*; *Cephalosphaera maxima*, *tibialis*; *Dorilas aquavicus*, *bidactylus*, *cinctus subtilis* n. sub. sp., *curtus*, *grandis*, *huachuacanus*, *lautus*, *montivagus*, *nevadaensis*, *sabroskyi*, *stainsi*; *Dorylomorpha canadensis*, *ornata*, *tridentata*, *uncinata*; *Tömösváryella brevijuncta*, *dissimilis*, *exilidens*, *lepidipes*, *pauca*, *propinqua*, *quadridentis* and *xerophila*. Nomenclatorial changes: *Dorilas* used instead of emended spelling *Dorylas*; *Eudorylas* Aczel made subgenus of *Dorilas*. New synonymy: *Prothechus* Rondani (*Verrollia* Mik is an isogenotypic synonym); *Prothechus auctus* (Fallen) (= *Verrollia virginica* Banks); *Cephalosphaera brevis* (Cresson) (= *Pipunculus eronis* Curran); *Dorilas affinis* (Cresson) (= *Pipunculus globosus* Cresson; *D. fuscus* (Loew) (= *P. cingulatus* Cresson); *D. fuscus* var. *nitidiventris* (Loew) (= *P. sororius* Cresson and *viduus* Cresson); *D. loewii* (Kertész) (= *P. semifasciatus* Cresson and *P. nigricornis* Adams); *D. nigripes* (Loew) (= *P. dubius* Cresson and *P. winnemannae* Malloch); *D. subopacus* (Loew) (= *P. confraternus* Banks and *P. occidentalis* Malloch); *D. subopacus industrius* (Knab) (= *P. confraternus* var. *melanis* (Hardy-Knowlton); *Tömösváryella subvirescens* (Loew) (= *P. pilosiventris* Becker, *albiseta* Cresson, *insularis* Cresson, *metallescens* Malloch and *knowltoni* Hardy); *T. vagabunda* (Knab) (= *P. trochanteratus* var. *tenellus* Hardy-Knowlton). New combinations: *Prothechus auctus* (Fallen), *csikii* (Aczel); *Jassidophaga fasciata* (Hardy), *pilosa* (Zetterstedt); *Cephalosphaera acuminata* (Cresson), *appendiculata* (Cresson); *biscaynei* (Cresson), *brevis* (Cresson), *constricta* (Banks), *elegantula* (Williston), *stricklandi* (Curran); *Dorilas abberatus* (Hardy-Knowlton), *acquus* (Cresson),

* Part I of the thesis submitted to the Department of Entomology and the faculty of the Graduate School of the University of Kansas in partial fulfillment of the requirements for the degree of Doctor of Philosophy.

aequus var. *argyrofrons* (Hardy-Knowlton), *aequus* var. *longipes* (Hardy-Knowlton), *affinis* (Cresson), *alpinus* (Cresson), *alternatus* (Cresson), *angus* (Cresson), *apicalis* (Hardy-Knowlton), *ater* var. *velutinus* (Cresson), *atlanticus* (Hough), *banksi* (Aczel), *caudatus* (Cresson), *caudatus* var. *discolor* (Banks), *cinctus* (Banks), *flavitarsis* (Williston), *fuscitarsis* (Adams), *fuscus* (Loew), *fuscus* var. *nitidiventrif* (Loew), *harmstoni* (Hardy-Knowlton), *houghii* (Kertész), *houghii apicarinus* (Hardy-Knowlton), *houghii curvifibiae* (Hardy), *lasiofemoratus* (Hardy-Knowlton), *latipennis* (Banks), *loewii* (Kertész), *luteicornis* (Cresson), *minor* (Cresson), *minor cressoni* (Johnson), *nigripes* (Loew), *pallipes* (Johnson), *reipublicae* (Walker), *stigmaticus* (Malloch), *stigmaticus brachystigmaticus* (Hardy-Knowlton), *subopacus* (Loew), *subopacus industrius* (Knab), *tarsalis* (Banks), *trichaetus* (Malloch), *varius* (Cresson), *varius* var. *mainensis* (Cresson), *varius* var. *phaethus* (Hardy-Knowlton) *vierecki* (Malloch), *willistoni* (Kertész); *Allomethus flavicornis* (Williston), *xanthopodus* (Williston); *Dorylomorpha atramontensis* (Banks), *caudelli* (Malloch), *exilis* (Malloch), *flavomaculata* (Hough), *occidens* (Hardy); *Tömösváryella appendipes* (Cresson), *bidens* (Cresson) *columbiana* (Kertész), *contorta* (Hardy), *coquilletti* var. *flaviantenna* (Hardy-Knowlton), *inconspicua* (Malloch), *sachtlebeni* (Aczel), *similis* (Hough), *sonorensis* (Cole), *subnitens* (Cresson), *subvirescens* (Loew), *toxodentis* (Hardy-Knowlton), *utahensis* (Hardy-Knowlton), *vagabunda* (Knab) and *wilburi* (Hardy).

INTRODUCTION

THE writer first became interested in the DORILAIIDAE (PIPUNCULIDAE) several years ago while studying under Doctor V. M. Tanner at Brigham Young University. At that time little or no success was to be had in making identifications of local material; only a few of the species could be placed in Cresson's Key¹ and the group had to be put aside unfinished. Later while at the Utah Agricultural Experiment Station the economic importance of these flies was brought vividly to the attention of the writer in the work on beet leafhoppers, under Doctor G. F. Knowlton, and part of his assignment was to make a more complete study of these important parasites. After summarizing the literature in this field it was found that there was little information concerning the western species and that a good many of them were apparently undescribed. This revisional study of the family has been in progress during the past three years at the University of Kansas, where now exists (in the Snow Entomological Collection) the largest, most complete collection of DORILAIIDAE in America. All of the available types of North American species were examined² before this study was completed.

1. 1911, Trans. Amer. Ento. Soc. XXXVI.

2. Made possible by a traveling grant graciously given by Doctor H. B. Hungerford.

Cresson's commendable paper in 1911 "Studies in North American Dipterology" was the last comprehensive survey of this family. Since that work the number of species and subspecies has been more than doubled and innumerable taxonomic changes have been made, so that the earlier revisions have become archaic. A great many problems have been encountered and no doubt there are still many to be straightened out before systematic stability can be reached in this family. Cresson's study has stimulated considerable interest in the taxonomy of these flies in America and many valuable contributions have been made to the literature since its publication, yet in spite of the attention they have received there is comparatively little information concerning their life histories and host relationships. They are known to be largely parasitic upon leafhoppers but only meager data have been compiled as to the exact leafhopper species involved, the degree of host specificity and their importance in biological control of injurious species. This family embodies a wealth of interesting and important biological problems and since there is rapidly becoming an intense need for data concerning their life histories much valuable work remains to be done along this line.

The DORILAIIDAE have been considered by some observers as the most adept and graceful fliers in the DIPTERA; due to their inconspicuousness and small size, however, it is somewhat difficult to verify this but if one has the perseverance to search them out with his eye as they fly through the vegetation he will see that they well deserve their close relationship to the SYRPHIDAE. The writer has found that in making observations of their flight it is best to sight through the grass against the sun until the glint of the wings of one is seen, then its undulating motions can readily be followed. The iridescence of their wings in the sunlight makes an easy target to follow but as soon as a shadow falls across the performer it disappears from sight, to be revealed again as soon as a ray of light catches its wings. It is a most fascinating sight to watch one of these tiny creatures flying irregularly through the tall grass, reminding one of a hawk soaring in and out through the trees of a dense forest, and, like the hawk, they too are searching for prey. The female appears to be the more erratic flier as she darts to and fro in the herbage, apparently examining every blade of grass in her search for suitable Homoptera nymphs; while the male, not being intent upon such an errand, flies in a more definite course. The enormous compound eyes which cover the entire head no doubt serve to give them the sharp vision which they would need to fit

into their particular niche in the world of parasites and episites. The patient observer in a grassy meadow may often see a female suddenly pounce down upon a selected individual, grasp it in her legs and insert her slender ovipositor in the conjunctiva between the sclerites of the abdomen; the well developed pulvilli and tarsal claws aid her in holding the host. The actual oviposition process is very difficult to observe because of the rapidity of the action involved. Two methods of oviposition have been recorded: Doctor F. X. Williams in his work on parasites of *Perkinsiella sacharrida*³ made the following observation:

"The victims selected are very small to perhaps a little less than half-grown leafhoppers. A suitable one being discovered by the hovering fly is suddenly pounced upon and snatched up into the air. The captive is sometimes dropped almost immediately as if unsuitable, others, however, are held in mid-air for from one to several seconds, the fly usually rising a little with her burden which would be dropped on a leaf or on the ground. Often immediately thereafter, *Pipunculus* would hunt out another hopper, showing that she must have several eggs ready for laying."

He also observed that the newly parasitized leafhoppers were apparently uninjured and would soon find their way back to the protection of their host plant. Doctor F. Jenkinson recorded the following observation of the oviposition of *Prothechus auctus* (Fall.) (*Verrallia*) in England:⁴

"As soon as a *Verrallia* saw a frog-hopper it poised itself in the air (like a Kestrel hovering, but with a certain intensity perceptible in its motionlessness), and if the position of its victim was favorable, it pounced upon it immediately. Then the frog-hopper hopped; in some cases the fly lost it; in some cases the fly reappeared instantly from the place to which the frog-hopper hopped. In one case I saw the frog-hopper land with the fly still on its back. . . . If the position was unfavorable, or stems got in the way (e. g. *Geranium robertianum*), the fly would circle round with its head towards the victim, like a male *Dolichopus*, seeking a point from which to pounce. On several occasions it failed to get hold. Once a fly pounced upon a frog-hopper which did not hop; the fly immediately left it. Another came up and looked at it, but went away without touching it. Was the frog-hopper already entertaining an egg, or was it a male, or for some reason unsuitable?"

TAXONOMY

In phylogenic position the DORILAIIDAE stand between the PLATYPEZIDAE and SYRPHIDAE. They possess many characters in common with both of these but differ strikingly in biology and structural details. The DORILAIIDAE are entirely parasitic in the larval stage while the larvae of the other families are predators or scavengers.

3. 1919, Some Observations of *Pipunculus* Flies which Parasitize the Cane Leafhopper at Pahalo Hawaii. Proc. Haw. Ent. Soc. IV, No. 1; 68-71.

4. 1903, Ent. Monthly Mag., XXXIX; 222.

The characters of the wing venation will best serve to separate these families, but once examples of each have been seen there can be no mistaking one for the other except in a few instances. Most of the DORILAIIDAE lack the striking colors of the SYRPHIIDAE and are much smaller in size; however, *Nephrocerus* and *Protonephrocerus* are of considerable size and light in color, looking superficially like many of the SYRPHIIDAE, especially of the genera *Sphaerophoria* and *Allograpta*. The male genitalia of DORILAIIDAE and SYRPHIIDAE show close relationship, the posterior portion of the abdomen being distinctly asymmetrical with the hypopygium twisted ventrally; the females of the two families possess very different genital structures, those of DORILAIIDAE being modified for piercing the body of the host.

The name *Dorilas* Meigen is adopted here in preference to *Pipunculus* Latreille in spite of the recognized controversy that this procedure will cause. Opinion No. 28 of the Rules of Zoölogical Nomenclature states, "The generic names contained in Meigen's Nouvelle Classification, 1800, must take precedence over those in his Versuch 1803, in every case where the former are found valid under the International Code." In Meigen's description of *Dorilas* he makes the statement "Tete hemispherique"; this would suggest one of the genera which actually possesses a hemispherical head and not *Dorilas*; making it questionable whether or not he had *Dorilas*, *Jasidophaga* or *Prothechus* before him. Because of this doubt the writer has previously preferred to retain *Pipunculus* until further proof was obtained. In correspondence with Professor Pius Sack it was learned that Theodore Becker has studied the Meigen types in Paris and designated Latreille's *Pipunculus* as being congeneric with Meigen's *Dorilas*. As Becker was the leading worker in the group at that time there is no possibility for a misidentification on his part. It has been argued by some that Meigen had not intended for this earlier paper to be used, that it was just an experiment on his part, nevertheless, it was published and unfortunately was brought to the attention of the scientific world in 1908 by Hendel.⁵ Meanwhile before the paper was discovered Meigen's 1803 genera and the early names of other workers were being established in the literature, so that when it appeared necessary to change to the older names usage stepped in to play a decisive part in the opinions of the majority of the workers. Whether or not usage should have preference over priority is debatable but unless the commission rules these

5. 1908, Verh. K. K. E. B. Gesll. in Wien. LVIII; 43-69.

names *nomen conservandum* the only alternative is to abide by the opinion given in the rules. At present it appears that this is a step toward taxonomic stability and it is realized that use of either name would bring criticism from one source or another as the question is so controversial. It so happens, however, that most of the American dipterists are in favor of using the 1803 names, while for the most part the continental European workers have changed to the 1800 names. These are used in Lindner's "Die Fliegen der Palaarktischen Region."

The following is Opinion No. 7 rendered by the Committee on Nomenclature, Division of Insect Identification, Bureau of Entomology and Plant Quarantine, Washington, D. C.:

"Concerning the family names *Dorilaidae* and *Pipunculidae*:

"Mr. D. Elmo Hardy has requested an opinion on the use of the family name DORYLAIDE in place of the family name PIPUNCULIDAE, in the order DIPTERA.

"OPINION. On the basis of the evidence presented, and in accordance with article 5 of the International Rules of Zoölogical Nomenclature, it is necessary to adopt the name Dorilaide in place of the name Pipunculidae.

"DISCUSSION. Latreille, in 1802 (*Histoire Naturelle, generale et particuliere des Crustaces et des Insectes*, Vol. 3, p. 463), described the genus *Pipunculus* with *campestris* Latr. as the type. Meigen, in 1800 (*Nouvelle classification des mouches a deux ailes*, p. 31), described the genus *Dorilas* with one unnamed species. Coquillett, in 1910 (*The type-species of the North American genera of Diptera*, p. 535), designated *Pipunculus campestris* Latr. as the type of the genus *Dorilas* Mg. Two genera thereby became isogenotypic, with *Dorilas* having priority. Article 5 states that, "The name of a family or subfamily is to be changed when the name of its type genus is changed." There seems no alternative but to change the family name in this case.

"No reason is apparent for accepting the amended spelling *Dorylas*, first proposed by Kertész in 1910, so the family name should be Dorilaidae. Kertész 1910 and Sack 1935 used the family name Dorylaidae.

"Opinion written by Alan Stone and concurred in by P. W. Oman, H. S. Barber, and C. F. W. Muesebeck. October 23, 1940."

The term *subspecies* is used in this paper to designate those groups of variants within a species which appear to be restricted in their geographical distribution; *variety* is used for variants from the typical which occupy the same geographical range.

The recent studies by Enderlein, Aczel and Collin have resulted in the erection of nine new genera of DORILAIIDAE and have introduced rather radical changes in the generic concepts in this family. These genera are for the most part based upon previous subgeneric characters and the groupings are not as clear cut as the old limitations and may be subject to some intergradation. There is no doubt

that this represents progression in the DORILAIIDAE taxonomy, and as new characters are brought to light and new importances given to the old characters other groupings will no doubt be erected which will further subdivide the family.

The DORILAIIDAE have generally been considered rather difficult to classify, but this certainly need not be the case, as their diagnostic characters are for the most part well defined. The main stumbling block has been in the jumbled taxonomic status of the group, and in many cases the varying specific concepts or lack of stress upon important characters. As these flies are comparatively rare in collections, and the sexes are so often unassociated, many species have been described from one sex, frequently a unique, the opposite sex sometimes being described as a distinct species. Still other species have been based upon variable characters which in the light of the thousands of specimens studied do not appear to be specific. The conclusions here are based upon studies of all the available specimens in the family. Much valuable information is to be gained and many problems yet to be solved by extensive systematic collecting and life history studies of these important flies.

Geographical distribution is not so important in this group as might be thought; many specimens have been described as new on nothing more than the fact that the examples were taken from some locality remote from the type of the species; the *Tömösváryella subvirescens* synonymy illustrates this. At present the seemingly queer distribution of many species is not understood: *e. g.*, why *Dorilas alpinus*, described from Vermont, should next appear in the mountains of Utah, or why *Tömösváryella coquilletti* should recently show up in Hungary. Knowledge of host requirements and distributional studies of suitable hosts may solve these problems.

MORPHOLOGY AND TERMINOLOGY

The head is large and composed almost entirely of compound eyes. The shape varies from hemispherical, in *Chalarus* to almost spherical in the higher genera, being for the most part generically distinctive. The hind margin of the eyes is strongly indented in members of the Nephrocerinae and almost straight in genera such as *Dorilas* and *Tömösváryella*. The head shape is greatly influenced by the size of the occiput, which is extremely narrow, almost completely hidden by the hind margin of the compound eyes in *Chalarus* and is very broad and puffed in females of *Cephalosphaera appendiculata* (Cresson), being intermediate between these extremes in other genera and species. The eyes of the males are

contiguous for at least a short distance on the front except in the *Chalarus*, NEPHROCERINAE, *Dorylomorpha* and some *Dorilas*. Those of the females are dichoptic, the front usually being slightly wider in the middle than at the antennae. The front varies from gently concave to convex longitudinally down the middle, from densely to thinly pollinose and from opaque to polished. The eyes are bare and the face and front have only microscopic pubescence with no strong bristles on head (exclusive of antennae) except in CHALARINAE. The antennae are composed of three segments, the first is small and obscure, seldom seen in ordinary microscopic observations. The second segment is many times wider than the first, in a few species almost equals the third and ordinarily is scarcely over one third the size of the large apical segment. It usually has short to elongate bristles above and below and the apex is narrowed below and fits up into an angulation of the third segment. The third segment assumes a great many shapes from almost oval through reniform to very long acuminate. For the most part the reniform type is restricted to the primitive genera in CHALARINAE and NEPHROCERINAE; however, *Dorilas banksi* (Aczel) and *Allomethus brimleyi* n. sp. possess this type of third segment. The third segment is covered with microscopic pubescence, sometimes densely so, which often gives a silvery sheen to the segment, especially around the margin. The arista appears to be of little importance taxonomically. It is fitted into a pocket on the upper hind margin of the third segment and is divided into three sections. The first, or basal section, is about half the length of the second and the third extends out into an elongate flagellum which is thickened basally and is usually wider near the base than the width of the first and second sections. Usually the whole arista is shining black, although in many species the first two sections and extreme base of third are lighter.

The mouthparts are of the typical muscoid type (fig. 1a, 2a) but dissection and examination of the structures indicates that specific characters are to be found in the rostrum, thyroid (mentum) and possibly the maxillary palpi. The maxillary palpi are elongate annulated structures with no apparent segmentation (fig. 2c), attached at bases to long rods which extend around the pump to the ventral portion of the thyroid (mentum).

Dorsum of thorax usually bare or with microscopic pubescence or pile, with strong bristles only in the CHALARINAE and NEPHROCERINAE. The propleurae is usually hidden by the broad occiput and in many genera possess brushes of long bristle-like hairs; however, *Beckerias*,

Claraeola, *Anacephalops*, *Dorylomorpha*, *Tömösváryella* and the subgenus *Eudorylas* of *Dorilas* have the propleurae entirely bare. The color of the humeri, although not a specific character in itself, is useful in setting off groups of species. The pollinosity of the thorax and abdomen appears to be produced by a covering of microscopic scales. The term metanotum is used here to designate that gibbose portion of the thorax lying beneath the scutellum; this usage may not be correct as there is a morphological question as to whether the true metanotum is present in higher diptera. The legs are usually simple, although the coxae, trochanters and bases of the femora are sometimes ornamented with processes or developments and, in members of *Tömösváryella*, with strong hairs or bristles. Femora are gently thickened apically with rows of short spines on the apical halves below in most species; the tibiae are gently curved in most species, with many longitudinal rows of short bristles, sometimes with two to many elongate hairs on the dorsal portion, with posterior pair strongly arcuated in many; however, *Tömösváryella contorta* (Hardy) has the femora and tibiae of posterior legs markedly contorted. Tarsi for the most part are rather slender, basitarsi generally equal to the next three subsegments in length; in many of the *Tömösváryella* the posterior tarsi are distinctly dilated, especially in the females. The tarsal subsegments usually possess a number of long fine hairs at their apices. The pretarsi (fig. 2d) are typical of the higher diptera. The tarsal claws are heavily sclerotized and articulate with the terminal tarsal subsegments above. The unguitractor or median basal plate of the tarsus widens basally and fits up under the terminal subsegment, its depressor muscles extending longitudinally down the tarsus on the venter. The empodium arises on the venter from the distal end of the unguitractor with no apparent articulation; it is simple and spinelike, extending three-fourths the length of the pulvilli in the specimens studied. The pulvilli are large and rounding lobes, densely covered with microscopic hairs. They arise from a pair of lateral plates, the auxiliae or auxiliary plates, which lie directly beneath the bases of the tarsal claws.

The wings are for the most part long and narrow, usually as long or longer than the body; *Dorilas latipennis* (Banks) is one exception to this, having short, broad wings. Members of *Tömösváryella* all have comparatively short wings about equal to body length. The wings vary from brownish iridescent to hyaline; however, most species have at least a slight iridescent tinge. The terminology for the

wing venation (figs. 5b, 7b) follows, for the most part, that system which is in general application in the family because of its simplicity. The writer has, however, supplemented this with the Comstock-Needham system as modified by Alexander, Lameere, Martynov and Tillyard for the sake of clarity; the latter modifications are applied in the interpretation of most of the veins as they appear to be more nearly correct. The term *subcosta* is used in preference to auxiliary vein to indicate that vein lying between the costa and first longitudinal vein as this is in more common usage. The first longitudinal vein is equal to R_{1+2} , as the interpretation of Alexander⁶ will certainly apply to higher Diptera. The radial sector is two branched, the anterior branch (R_{3+4}) being designated as the second longitudinal vein; the posterior branch (R_5) as the third vein. The true position of vein R_4 is not clearly understood in Dorilaidae. There is a question as to whether it is fused with R_3 or with the basal portion of R_5 and has been lost by atrophy at its tip. In its phylogeny through more primitive groups vein R_4 has migrated to and become fused with R_3 so this interpretation seems more logical. The crossveins are termed r-m and m-cu in preference to "small" and "large" crossveins, using the new interpretation of the position of m-cu; the posterior crossvein is that which connects the two branches of media (Crossvein m); the basal portion of the vein which was formerly known as Cu_1 is now interpreted as the medio-cubital crossvein. The fourth vein (M_{1+2}) is very important taxonomically and may for convenience sake be divided into the following sections: *first section* equals that portion of vein from base to branch of media; *second section* equals that part from branch of media to r-m crossvein; *third section* equals from r-m crossvein to m crossvein and the *last* or *fourth section* is from m crossvein to the wing margin. The comparative length of the second and third sections, in other words the position of the radiomedial crossvein in relation to the discal cell (first M_2), is a good diagnostic character. The presence or absence of an appendage of a vein on the last section of the fourth vein is used as a generic character; this appendage is the rudiment of vein M_2 and is present in the Nephrocerae as well as the genera *Prothechus*, *Cephalosphaera*, *Anacephalops* and most *Claraeola*; the degree of curvature of the last section of fourth vein is of specific importance. The fifth vein (M_{3+4}) may be divided into sections as the fourth but its ultimate section, that portion from the m crossvein to the wing margin, is the only part which appears to be of tax-

6. 1929, International Congress, Ent. IV, Proc.

onomic importance. The length of the petiole of the cubital cell appears to be of some significance. In light of the new interpretation of the posterior veins, the vein considered Cu_2 by Comstock-Needham is now known as Cu_1 and their second anal is now first anal vein; thus their anal cell should actually be the cubital; this interpretation should be given to all previous works in the DORILAIIDAE. The costal margin of the wing is divided into sections to facilitate designation: the *first section* is that from the wing base to the humeral crossvein; the *second section* is from humeral crossvein to the apex of the subcostal vein; the *third section* is that portion from end of subcostal vein to end of the first longitudinal vein (R_{1+2}); the *fourth* being that section from end of first vein to end of second (R_{3+4}); the *fifth* extends between the apices of the second and third veins. A stigma may be present or absent in the wing, depending upon the particular genus involved; when present it occupies a small portion to all of the third costal section.

The abdomen varies a great deal in shape but the typical form is subcylindrical, rounding on the sides, widest at segments two to three; sometimes the sides are straight or nearly so; some species may have the abdomen widest at base while others may be narrowed anteriorly and clavate. Abdomen varying from densely pollinose, velvety opaque, subshining to brightly metallic. The genital portion of the abdomen takes in those segments and appendages beyond segment five. It exhibits much torsion and asymmetry toward the left side. The degree of twisting varies a great deal with different genera and species but its evolution can be traced to an extent from the CHALARINAE up through the higher groups. The sixth tergum is dorsal in position and appears to be normal in the more primitive groups. As this plate is followed up through the phylogenetic scale it is twisted to the left towards the venter where it forms a basal plate giving support to the genital structures. The seventh tergum is lateral in position, extending from the dorsum to the venter on the left side; the seventh and eighth segments combined form a large genital chamber into which folds the ninth segment and copulatory structures. The eighth segment occupies the posterior tip of the abdomen in all of the higher groups; however, in the CHALARINAE it is reduced to a relatively small segment occupying the left side of the apex (fig. 9d). The eighth segment is generally large in size and usually possesses a small to large membranous area or depression, often referred to as the *genital cleft*, especially in previous works. Most external genital characters are dependent upon the

particular shape of the eighth segment from dorsal view; the degree of symmetry of this portion, the extent and position of the membranous area etc., are valuable taxonomic characters. The genital appendages usually show great diversity of form and present excellent characters for separation of species. The appendages of the ninth segment are true harpagones, as their musculature has been worked out (fig. 2e); the harpagones are usually alike although the two may differ greatly one from the other. The cerci and anal region are located in a convexity on the distal portion, between and anterior to the harpagones; the cerci are of taxonomic importance in the *Tömösváryella*. The aedeagus varies from a simple tube to bifid or three pronged and may be elongated and coiled (fig. 16f). The accessory plates and structures making up the aedeagus are diverse in form and probably possess specific characters. The musculature of the aedeagus is very complex and is not well understood (fig. 2f).

The recent work of Doctor Marton Aczel⁷ is to be highly praised as it is the most valuable contribution that has been made to the study of the morphology of the Dorilaidae genitalia. The terminology employed in his paper, however, appears somewhat cumbersome in light of that applied here in America but the paper illustrates very well the taxonomic importance of the genital structures. In the present work there is no attempt to introduce new and unfamiliar terms as this would only tend to complicate terminology and probably make the paper less usable and understandable. A comparison of the terminologies of the male genital structures as interpreted by this author and that as used by Aczel is given: The *sixth tergum* is termed the "Praehypophygialplatte" (Lamella praehypopygialis) by Aczel; the *seventh tergum* is termed the "Hypopygialplatte" (Lamella hypopygialis), when this plate extends around to the venter it is called "Pseudoforeeps"; the *eighth segment* is called "Basalring" (Basis hypopygii) and the *ninth segment* (of this author) is termed the "Basalplatte" by Aczel. The *harpagones* are called the "Mesolobi" (Valvulae mediales or cerci) and the *cerci* are given the name "Pinsel" (Penicillium); Aczel correctly applies the term cerci in his later paper.⁸

The well adapted ovipositing structure of the female is composed of modified seventh, eighth and ninth abdominal segments; the seventh segment sometimes is extended to give the ovipositor greater length as in *Jassidophaga fasciata* (Hardy) (fig. 6d). The seventh

7. 1939, Das System der Familie Dorylaidae, Zoöl. Anz. Band 125, Heft ½; 15-23.

8. 1940, Zoöl. Anz. 1.12, Bd. 132, Heft ¾.

segment makes up the basal portion and the eighth and ninth are combined to form the actual piercing structure. The ovipositor sometimes shows distinct articulation between the piercer and the base but more often they are completely fused. The anal opening is on the dorsum of the piercer, near the junction with its base, it is conspicuous because of the presence of the pilose cerci, a lobe on either side of the anus. The vaginal opening is on the venter of the ovipositor, usually situated in a thickened portion near the base of the piercer. The piercer is grooved above from the anal opening to its apex, this serves as an egg tube. In copulatory position the long piercer of the female fits up into the genital cavity of the male (fig. 102e) in order that the vagina may be reached by the aedeagus. In this position the male carries the female and often they are captured in this condition, usually separating, however, unless they are killed immediately.

Much remains to be learned concerning the internal morphology of these flies. The writer has made only preliminary studies of the internal systems and structures and the technique is in such an experimental stage that very little actual data have been gathered. Fair success has been had with musculature studies by killing and fixing with Kahl's and Zenker's solutions. The ovaries are difficult to study because of their position and small size; they occupy a relatively small area in the posterior portion of the abdomen, closely attached to the dorsal wall, mainly of the fifth and sixth terga.

ECONOMIC IMPORTANCE

The DORILAIIDAE are among the most important of the parasitoid DIPTERA and are no doubt very influential in biological control of many homopterous pests; their full significance is not yet known but this group shows great promise for future control work. They are generally considered parasites strictly of HOMOPTERA but some writers have suggested that they might also parasitize some Hemiptera; Curran⁹ states, "The larvae are parasitic on bugs of the families Cicadellidae and Miridae and perhaps on other HOMOPTERA and HETEROPTERA." The writer has no confirmation of their affecting groups outside of HOMOPTERA. They have been definitely associated, in various parts of the world with CICADELLIDAE, FULGORIDAE and CEROPIDAE and European workers have stated that *Nephrocerus* are probably parasites of CICADIDAE but this again is unconfirmed.

9. 1934, Families and Genera of North American Diptera, p. 245.

The most outstanding work on the biology of these flies has been done by R. C. L. Perkins on the Australian and Hawaiian Fauna¹⁰ and by F. X. Williams and Swezey in Hawaii.¹¹ The DORILAIIDAE parasitizing the Sugarcane Leafhopper (*Perkinsiella sacchiricida* Kirk) in Hawaii have been studied thoroughly by these workers and three species were found to be instrumental in control of this pest: *Dorilas* (*Pipunculus*) *juvator* (Perkins), *D. hawaiiensis* (Perkins) and *D. oahuensis* (Perkins). The life cycle of these species requires two to three months.

So few of the known American species have been reared that very little is known about their host relationships. We know that some species of leafhoppers are attacked by more than one species of Dorilaidae but just how host specific the flies are has not been studied in America. Perkins states that *Pipunculus beneficiens* Perkins in Australia, was bred from three or four different species of leafhopper and *P. cruciator* Perkins from two widely different genera. It seems probable that this condition may prove the exception rather than the usual thing when the American species have been more fully worked out, although the unusual distribution of some species suggests that they may utilize more than one host species.

The beet leafhopper (*Eutettix tenellus*) has received considerable attention in western America and our only published biological studies have been in connection with this leafhopper. The work of Severin and Knab in California; Doctor G. F. Knowlton and H. E. Dorst at the Utah Agricultural Experiment Station and Charles Henderson, formerly at the beet leafhopper laboratory in Twin Falls, Idaho, has established quite definitely that two species of DORILAIIDAE are concerned in the parasitism of the beet leafhopper in the West; *Tömösváryella vagabunda* (Knab) is by far the most important species involved, while *Dorilas subopacus industrius* (Knab) is comparatively of minor importance; in most localities at least ninety-five percent of the material reared from beet leafhopper will belong to the first species. These flies no doubt play a very important part in helping to keep this pest in check, in dissecting specimens of *Eutettix tenellus* taken in the desert breeding grounds the writer has found as high as forty percent of the specimens containing Dorilaidae larvae. Mr. H. E. Dorst has reported

10. 1903, The Leafhopper of the Sugar Cane. Bull. Board Agri. Forestry Hawaii No. 1; 23-24.

11. 1905, Leafhoppers and Their Natural Enemies. Haw. Sugar Planters Assoc. Expt. Sta., Bull. 1, Pt. 4; 123-157.

that sixty percent of the beet leafhoppers were parasitized the spring of 1936 at the time of the leafhopper migration. T. Esaki and S. Hashimoto¹² reported that sixty-five percent of the *Nephrotettix bipunctatus cincticeps* examined in 1935 were parasitized by *Pipunculus*.

The eggs are placed inside the abdomen of the host by the ovipositor piercing the conjunctiva between the segments or by insertion directly through the body wall. This procedure apparently doesn't injure the leafhopper a great deal and the larva grows to maturity along with its host. When the larva is full grown it fills the entire abdomen and often extends part way into the thorax; it then breaks out of the abdomen, killing the host, and pupates as soon as a suitable spot is found. Some species may drop to the ground and pupate in the soil while others pupate on or at the bases of the leaves of plants or in debris, fallen leaves, etc., on the ground.

The larvae are oblong, rounding at ends but slightly more pointed in front; the segmentation is not distinguishable because of the wrinkled nature of the cuticula; however, ten or eleven somites appear to be present. Many species possess microscopic spicules on the cuticula. The exact number of instars has not definitely been determined; from study of the available larvae there appears to be four distinct instars, although there may prove to be five, as often there seems to be five growth stages from the young to the mature larvae. The mouth is just a simple opening with no indication of external mouth parts; however, a pair of heavily sclerotized, darkly colored mandibles "mouth hooks" are present; these "hooks" appear in the first instar and are shed with the last moult. The larvae are amphipneustic, with only the first pair and posterior spiracles open; the anterior pair are located near the sides, usually just posterior to the "mouth hooks" (figs. 3a-c). The posterior spiracles are situated on a sclerotized plate located in the middle just anterior to the posterior end of the larva. There appears to be two or more pairs of spiracles that open in this stigmal area. The arrangement of the spiracles and processes of these stigmal plates (figs. 4a-d) as well as the structure of the mandibles apparently are diagnostic for separation of the species in the larval stage; lack of material has prevented further investigation of this subject.

12. 1936, Report on the Leafhoppers Injurious to the Rice Plant and Their Natural Enemies. Fukuoka, Ent. Lab. Dep. Agri. Kynshu, Univ. No. 7, 31 pp., 5 pl.

The earlier instar larvae are more slender and the mouth hooks seem more pronounced. The writer has been unable to find indications of spiracles until the last instar, and stigmal plates seemingly develop at the last moult. The later instars become more flattened out, and shorter in proportion to their width, the cuticula becomes wrinkled and somewhat darker. When the larva breaks from the abdomen of the host, the last larval skin is retained, becomes darker in color and hardens to form the reddish brown puparium.

The first instar larvae of *Tömösváryella vagabunda* (Knab) in *Eutettix tenellus*, are about the length of an abdominal segment of the leafhopper and increase a little more than the length of the sternum in each distinct growth period. The young larvae are very near the size, shape and color of the leafhopper eggs but can be recognized by the presence of the dark colored mandibles. Larvae are much harder to locate in dark bodied hosts. The larvae usually face anteriorly in the body of the host; however, specimens dissected from *Ballana* sp. were directed posteriorly.

The writer has dissected out many species of DORILAIIDAE from various genera and species of leafhoppers, but as the life histories have not been worked out, the larvae are unidentifiable.

COLLECTING AND METHODS OF STUDY

Although the DORILAIIDAE are comparatively rare in collections, they are usually very abundant in nature, especially in certain situations. A greater variety of species are to be taken by sweeping in grasses of various kinds than in any other type of habitat, although they may be collected in a great many different plant associations, depending upon their particular host requirements. The inconspicuousness of these flies and the fact that small DIPTERA are for the most part unattractive to most collectors accounts for their scarcity in collections. A little effort put forth in sweeping most any grassy meadow will usually yield several species, often in large numbers. These flies are definitely seasonal, most species being more abundant in the spring and fall, due, of course, to two generations per season. In many situation where Dorilaidae were numerous in the southeastern and southwestern parts of the United States, the writer has attempted to associate them with their homopterous hosts by taking numerous leafhopper samples and habitat notes. Shortage of time has prohibited the dissection of these numerous samples, so the parasitism data are not available at this time.

HABITAT STUDIES

Throughout several collecting seasons the writer has gathered data concerning the plant associations and situations in which DORILAIIDAE have been taken. It has been found that most any grassy situation will usually yield one to many species, depending, of course, upon the time of the season, as the abundance of some species varies a great deal throughout the spring, summer and fall. A day's difference often makes a striking contrast in the abundance of any particular species; in fact, even the hour of the day plays a very important part in the abundance or scarcity of individuals. A few miles southeast of Ely, Nevada, Doctor R. H. Beamer and the writer collected in a tall cheat-like grass and found the DORILAIIDAE very scarce from seven o'clock until eight in the morning. Shortly after that time they became very numerous. Specimens of a number of species were common, hovering along a small mountain stream above Tajique, New Mexico, from about nine to ten a. m. After this time none were taken. The writer spent several days in the Chiricahua Mountains in Arizona observing DORILAIIDAE hovering along small streams. Specimens of *Cephalosphaera maxima* n. sp. were seen only between nine-thirty and ten o'clock in the morning. In this same locality *Chalarus spurius* (Fallen) were exceedingly abundant in willows from two to four o'clock in the afternoon, while at dusk they were very scarce. Early in the morning no specimens could be found. *Dorilas ater* (Mg.) and *Chalarus latafrons* n. sp. were observed hovering over huckleberry oak in Yosemite National Park, California, during the early part of the morning, but as the day became warmer these became scarcer. These are but a few of the examples in which their abundance appears to be influenced by temperature, moisture, shade, sunlight and perhaps other factors. It has been discovered that many species of *Dorilas* and a few *Cephalosphaera* were attracted to water and moist situations, especially in mountainous regions. Some of the best DORILAIIDAE collecting is to be had by sitting beside a small mountain stream and taking the specimens as they come in to the water. These are readily seen as they hover in the sunlight and, if one observes them a short while, they will usually alight upon a moist stone, leaf or twig and appear to be lapping up moisture. Doctor Beamer and the writer have found that these could easily be aspirated directly out of the air as they hovered, or from the stones, etc., as they were resting. A situation of this kind will ordinarily yield a variety of different species, many of which are seldom taken in other places, possibly because they may

parasitize arboreal leafhoppers and not be easily obtainable in their natural habitat. It is strongly suspected that oak leafhoppers may serve as hosts for many of these species as oaks have been the predominant trees in all localities where this phenomenon has been observed. It is not unusual to take specimens hovering in the shade or in the sunlight beneath trees. Specimens of *Dorilas hauchucanus* n. sp. were often taken in camp (in Arizona mountains) at meal time, hovering over liquids, open milk bottles, coffee in cups, water buckets, etc., and could be aspirated out of the air if one would cautiously approach, with the aspirator tube, the spot where they were hovering. The inquisitive flies would often approach or even alight upon the end of the tube of the aspirator.

A few of the grasses from which *Dorilaid*s have been taken are as follows: Bermuda grasses have yielded *Tömösváryella subvirescens*, *T. bidens*, *T. agnesea* and many others; salt and buffalo grasses, *Tömösváryella* spp. of the *similis*, *toxodentis*, *utahensis* and *vagabunda* groups; blue grass, *T. contorta* and spp. in *subvirescens* and *similis* groups; reedtop, panic grass and tickle grasses, *Tömösváryella* spp., *Dorilas* spp. and *Dorylomorpha exilis* et al.; Johnson grass, *Dorilas* spp., *Tömösváryella agnesea* and spp. of *subvirescens*, *similis* and *toxodentis* groups; short desert clump grass, *Tömösváryella xerophilus*, *tumida* and *wilburi*; tall clump grasses, *Dorilas minor*, *D. subopacus industrius*, *Tömösváryella vagabunda* group, *subnitens* and *agnesea*; slough grasses, *Tömösváryella*; orchard grasses, brome, millet, gama grasses et al. have yielded many species. Comparatively few specimens were collected in sedges throughout southeastern United States, the summer of 1939 but in the Southwest and West the summer of 1940 the sedge meadows were found to contain a great variety of species. This appears to be the natural habitat of the western species of *Dorylomorpha* and is the only environment in which the writer has taken members of this genus *Dorilas nigripes*, *ater*, *banksi*, *varius mainensis*, *affinis*, *fuscus*, et al., *Chalarus latafrons*, *Tömösváryella sylvatica*, *coquilletti* and others have been collected in sedges also.

The *Arundinaria* (cane) in southeastern United States contains two species of *Dorilas*, *minor* and *alternatus*, which apparently parasitize leafhoppers of the genus *Arundanus*, or the fulgorid, *Stenocranus arundineus* Metcalf, or perhaps both. A number of different kinds of oaks throughout the West have produced *Chalarus latafrons*, *spurius*, *Dorilas ater*, et al. and *Tömösváryella* of the *similis* and *utahensis* groups. *Chalarus spurius* and *latafrons* have been

taken commonly in willow, probably associated with *Empoasca*; *C. latafrons* has also been taken hovering in the sunlight beneath aspen trees where *Empoasca* and *Idiocerus* leafhoppers were thick in the trees. The beet leafhopper parasites, *Tömösváryella vagabunda* and *Dorilas subopacus industrius* are commonly taken on *Eutettix tenellus* host plants, i. e., *Salsola pestifer*, *sofia*, *flaree*, *Atriplex* spp., and *Beta vulgaris*. Doctor Knowlton adds: *Atriplex rosea*, *Atriplex argentia*, *Atriplex nuttali*, *Bassia hyssopifolia* and blistercress or *Cheirinia repanda*. Other plant associations are as follows: *Ceanothus*, yielding *Chalarus latafrons*, *Tömösváryella* spp., *utahensis* group; alfalfa, *Dorilas subopacus industrius*, *Tömösváryella subvirescens* and spp. of *vagabunda* groups; *Chambaebatia foliolosa* (Bear clover), *Tömösváryella bidens*, *subvirescens* and spp. in *utahensis* and *similis* groups; *Arctostaphylos pungens*, *Chalarus latafrons*. The manzanitas haven't been systematically collected for Dorilaidae but since these plants support such a fauna of leafhoppers they certainly should serve as a potential habitat for these parasites. Fern growth has yielded, *Dorilas subopacus industrius*, *Tömösváryella* spp. and *Chalarus spurius*; dogwood, *Dorilas* sp.; *Chrysothamnus* and *Artemisia*, *Tömösváryella* spp. taken in copula on bushes; wild licorice (*Glycyrrhiza*), smart weed (*Polygonum*) and wild mint (*Mentha*) several species of *Tömösváryella*, possibly accidentals; wild columbine and lupine meadow, *Tömösváryella utahensis* and *vagabunda* group; dense forest undergrowth, *Dorilas* spp. *Chalarus spurius* and *Tömösváryella* spp., *utahensis* and *similis* groups; one specimen of *Dorilas affinis* has been taken on *Pinus ponderosa* but this was probably an accidental.

Occasional specimens of *Dorilas ater* (Meigen) and *Charlarus latafrons* n. sp. have been taken at light but this is certainly not a common behavior.

METHODS OF PREPARATION FOR STUDY

The best method for mounting DORILAIIDAE is on paper points, bending down the point slightly at the tip and taking care to attach the fly firmly on the right pleura, high enough that the legs are entirely free. In the genus *Tömösváryella* it is especially essential that the specimens be mounted securely and neatly so the legs are available for study and the abdomen may be dissected without detaching the specimen from its attachment. The more essential diagnostic characters for this genus are found on the posterior trochanters and femora, middle coxae and in the male genital structures. It

is extremely irksome to receive specimens for determination which have been placed "feet first" in an excess amount of glue which obscures all of the leg characters; such specimens are useless unless remounted. In this respect it might be well to make a plea that a celluloid glue be used, then if for some reason remounting is necessary the specimen can be removed from the point without being injured. It is likewise troublesome if the specimen is not glued firmly to the tip or if the glue used was not of the right consistency. Glueing to the side of the pin as recommended by Curran for small *Diptera* is not satisfactory for these flies as the bases of the legs are apt to be glued down, if this method is used it is desirable to attach the specimens to the ring of glue toward the upper portion of the pleura so the legs are directed at a slight angle away from the pin. *Minuten nadeln* make very good mounts, but if the specimen thus mounted is to be dissected it should be relaxed first, as dry *nadelned* specimens often break in the thoracic region when the genitalia are clipped off.

In order to study the genital structures it is usually necessary to dissect off the apical portion of the abdomen at the third or the hind margin of the fourth segment depending upon how far forward the harpagones extend on the venter. This portion is removed by fine dissecting scissors in a dry or relaxed state depending upon the specimen, or it may be taken off by first relaxing the specimen and then carefully picking a line around the sclerites of the abdomen with a fine needle; this method may be speeded up somewhat by further softening the cuticula by painting a line of hot caustic potash where the dissection is desired. After removal the terminal portion is placed in a ten-percent aqueous solution of caustic potash and allowed to stand for one to twelve hours according to the amount of sclerotization; or the part may be sufficiently cleared in one to three minutes in boiling caustic. After this clearing and relaxation it may be transferred directly to glycerin for study. To obtain an unobstructed view of the harpagones it is usually necessary to lift the genital portion of the abdomen away from the genital chamber which lies on the right side under the fifth and part of the fourth segments.

Numerous methods for preservation of the hypopygia have been tried but the most successful from all standpoints has been simply to place them in minute vials in a very small bit of glycerin, these are placed upon the pin with the specimen; flat-bottomed shell vials, 4×10 mm. are used. It is essential that only a small amount of glycerin be placed in the vial, just barely covering the bottom, and

that the pin be placed through the cork on a slant so the liquid and the stopper will not come in contact; if this happens, the osmotic pressure will draw the fluid from the vial through the cork. The first method tried was to mount the structures on microscope slides. This required additional time in preparation and was not entirely satisfactory. It is often difficult to obtain a true conception of the genitalia in a mount of this kind because of the flattening and distortion caused by the pressure of the cover glass. This distortion has been remedied by using rings or by placing fine pieces of glass rods upon the slide to support the slip so it will not actually contact the object; however, in this type of mount the convection currents may sometimes cause the edges of the sclerites to curl under. It is rather cumbersome to take care of materials when the genitalia are on a slide, often remote from the specimen on the pin and the view is usually too fixed. The next method tried was to clear the genitalia, extend and place the structures as desired, dehydrate to xylol and mount them on the tip of a minuten nadeln. This works rather well with larger specimens but upon drying the whole structure shrivels slightly, causing some deformity, making it difficult to observe the details that are sometimes needed. The last two mentioned procedures allow only a fixed perspective of the parts while that in the liquid medium permits free movement of all the structures as needed.

In working with DORILAIIDAE it has been necessary to work out a technique for replacing the heads as these flies are notorious for the ease with which their heads drop off; it is often impossible to handle specimens without them becoming decapitated. The writer has found that the best method of glueing these is to use clear shelac; a small amount is applied to the cervix by using a fine insect pin which has been bent at the point to hold the droplet at the very tip of the pin, this facilitates the accurate placing of the glue so that no more than necessary is applied. The head may then be picked up by moistening a clean pin and touching it. The head then can be placed in its proper position, usually with no harm done. Cellulose glue has been found to dry too rapidly to permit orientation of the head.

LEAFHOPPER DISSECTION

In searching for dorilaid larvae the leafhoppers are dissected with small needles, one needle being placed on the posterior end of the abdomen (genital segments) to hold the specimen firm, with the other needle the head and thoracic segments are removed one by

one. If a full grown larva is present the anterior end will be visible protruding from the base of the abdomen. The mature larva is recognized by size, darker color and hardness. The larva can be removed by carefully picking away the abdominal sclerites until it is fully exposed. By removing the segments from one to four and prying through the contents of the abdomen the smaller larvae, if present, can readily be found; these are easily recognized by their conspicuous mandibles. The observer may rarely find two first instar larvae in the abdomen; but certainly under such conditions in nature one or both of the parasites would be killed due to crowding of the larvae as development continues in the leafhopper abdomen. There is apparently no sure way to recognize a parasitized leafhopper externally, however, male specimens which contain mature larvae usually have the abdomen abnormally distended. A parasitized female has the same appearance as one which is gravid. In cleared specimens the dark mature larvae may sometimes be seen through the cuticula.

FOSSIL DORILAIIDAE

Our knowledge concerning the fossil DORILAIIDAE was brought up to date recently in the commendable study by Carpenter and Hull,¹³ this paper describes four new species, bringing the total number of known species up to six. These belong in four extant genera: *Protonephrocerus*, *Nephrocerus*, *Prothechus* and *Cephalosphaera* and excepting one species, *Protonephrocerus florissantius* Carpenter-Hull, described from Florissant, Colorado (Miocene), all are from Baltic amber deposits (Oligocene). These species all exhibit the primitive forking of the main branch of medius and in *Protonephrocerus collini* Carpenter-Hull vein M₂ extends to the wing margin. Aside from the above mentioned the following are the known fossil species: *Prothechus succinius* (Meunier), *P. extinctus* (Meunier), *Nephrocerus oligocenicus* Carpenter-Hull, and *Cephalosphaera baltica* (Carpenter-Hull).

KEY TO DORILAIIDAE GENERA OF THE WORLD

1. Ocellar bristles present; head hemispherical; occiput very narrow, scarcely visible from lateral view; densely pilose species.....(Charlarinae). 2
- No ocellar bristles; head nearly spherical; occiput generally swollen and plainly visible; usually not densely haired..... 4
2. Wing venation complete, discal cell closed..... 3
- Wing venation incomplete, discal cell open apically, posterior crossvein (median crossvein) and major part of veins M₁₊₂ and anal vein lacking (fig. 9b),

Chalarus Walker, p. 32

13. 1939, Bernstein-Forschungen, 4; 9-17.

3. Fourth vein (M_{1+2}) appendiculate, with a fork or appendix beyond posterior crossvein (fig. 5b).....*Prothechus* Rondani, p. 26
Fourth vein normal, no appendix.....*Jassidophaga* Enderlein p. 29
4. Hind margin of each eye with a deep excision at middle; margins of mesonotum and scutellum with strong bristles; third antennal segment reniform or obtusely pointed below(*Nephrocerinae*) 5
No strong excision on hind margin of eyes; without strong mesonotal or scutellar bristles; third segments of antennae usually pointed below..... 6
5. Stigma absent, axillary lobe of wing present, wing margin not formed by anal vein; third antennal segment reniform; propleurae with a fringe of long hairs.
Nephrocerus Zetterstedt, p. 37
Stigma present and filling the elongate third costal section; no axillary lobe to wing, the wing margin being formed by anal vein; third segments of antennae more elongate and obtuse below; propleurae bare.....(*Chile and Argentine*)
Protonephrocerus Collin, p. 37
6. Anal vein complete, reaching wing margin or verging with the cubital vein..... 7
Anal vein lacking, except for a rudiment present at base.....(*Hungary*).
Beckerias Aczel, p. 127
7. Stigma absent; no darkened area between the subcostal vein and end of R_{1+2} .
(*Tömösváryellinae*) 11
Stigma present, usually filling most of the third costal section and very conspicuous.
(*Dorilainae*) 8
8. Posterior lobe of wing well developed; third antennal segment scarcely larger than the second, generally obtuse below; vein M_{1+2} usually forked (one large species from Formosa, 7.5-8 mm.).....*Claraecola* Aczel, p. 127
Posterior lobe of wing rudimentary or scarcely developed; third antennal segment much larger than second, usually acute or acuminate; vein M_{1+2} may be forked or simple; usually much smaller species..... 9
9. Fourth vein (M_{1+2}) with an appendix beyond posterior crossvein (fig.) 12h..... 10
Fourth vein normal9a. *Dorilas* Meigen, p. 54
9a. Propleurae with a fan of long hairs.....*Dorilas* (*Dorilas*) Meigen, p. 55
Propleurae bare, not haired.....*Dorilas* (*Eudorylas*) Aczel, p. 55
10. Third costal section closed by a supernumerary crossvein; base of abdomen yellow in all known species, (known only from Australian Zone).....*Collinias* Aczel, p. 127
Third costal section always open never closed by a crossvein.
Cephalosphaera Enderlein, p. 40
11. Vein M_{1+2} forked, M_2 present as an appendix.....*Anacephalops* Aczel, p. 128
 M_{1+2} simple, vein M_2 fused with M_1 12
12. Crossvein r-m situated near basal portion of discal cell..... 13
Crossvein r-m situated at about middle of discal cell; eyes of male contiguous for at least a short distance on front.....*Tömösváryella* Aczel, p. 144
13. Eyes of male dichoptic; abdomen strongly swollen posteriorly, narrowed basally, clavate in both sexes; male hypopygium large and conspicuous; third antennal segment acuminate pointed below.....*Dorylomorpha* Aczel, p. 131
Eyes of male contiguous on the front; abdomen gently tapering posteriorly; male hypopygium small, inconspicuous; third antennal segment acute to obtuse or rounding below*Allomethus* n. genus, p. 128

Prothechus Rondani

Prothechus Rondani, 1856, Dipt. Ital. Prodr. I, 139.

Prothechus Becker, 1897, Berl. Ento. Zeitschr. XLII, 93.

Verrallia Mik, 1899, Wien. Ent. Zeit. 18, 137. This is a change of name for *Prothechus* Becker, nec Rondani.

Prothechus Hough, 1899, Bost. Soc. XXIX, 85.

Prothechus as listed in Rondani's index, Scudder's Nomenclator Zoologicus and as used by Hough et. al. is a typographical error, as is *Protechus* as listed by Sack, 1935, Die Flieg. der Palear. -Reg. Lief. 93, 5.

Prothechus Rondani was apparently based upon a misidentified genotype. This was given as *Pipunculus auctus* Fallen yet it seems evident from Rondani's description that he had a specimen of *Dorilas sens. lat.* before him. His description states "Venae quintae longitudinalis cubitus appendices venosa praeditus. . . . antennae articulo. Tertio inferne acuminato sublaevolato." This description applies only to the appendiculate group of the old *Dorilas*, now recognized as a distinct genus (*Cephalosphaera*). It has previously been stated by Mic¹⁴ and Verrall¹⁵ that Rondani's species was actually *Pipunculus furcatus* Egger as this was the only European species possessing the furcate third longitudinal vein and an acuminate third antennal segment.

Doctor Marton Aczel recently described a second European species in this group, *Cephalosphaera germanica*, so there is no way of knowing which of these species Rondani described. Becker¹⁶ re-described Rondani's genus *Prothechus* basing his description upon the true *P. auctus*. Mik¹⁴ discussed this question and stated that the genus described by Becker was very different from that of Rondani. He proposed the name *Verrallia* to take the place of *Prothechus* Becker, preoccupied by *Prothechus* Rondani. The procedure established by the International Commission in Opinion 65 is not in accord with Mic's action and *Verrallia* Mic should be considered an isogenotypic synonym of *Prothechus* Rondani. Opinion 65 is as follows:

"65. Case of a Genus Based upon Erroneously Determined Species.—If an author designates a certain species as genotype, it is to be assumed that his determination of the species is correct; if a case presents itself in which it appears that an author has based his genus upon certain definite specimens, rather than upon a species, it would be well to submit the case, with full details to the Commission. At the present moment, it is difficult to lay down a general rule."

14. 1899, Wien. Ent. Zeit. XVIII, 137.

15. 1901, British Flies, VIII, pp. 63-70 and 80.

16. 1897, Berl. Ent. Zeit. XLII, 139.

In accordance with this opinion *Prothechus* must be recognized as defined by its named genotype, therefore this name must replace *Verrallia* Mic. This action has been approved by the committee on nomenclature at the United States National Museum.

This genus is characterized by having the head hemispherical, ocellar bristles well developed, third antennal segment rounding apically, and the fourth vein (M_{1+2}) with an appendix beyond the posterior (median) crossvein; rather densely pilose species.

Genotype: *Prothechus auctus* (Fallen) (*Cephalops*).

Two North American species belong in this genus; they can be separated by the following characters:

A. Stigma long, as long as third costal section.....*auctus* (Fallen), p. 27

AA. Stigma short, not over one-half as long as third costal section
csikii (Aczel), p. 28

Prothechus auctus (Fallen)

(Plate 1, figs. 5a-c)

Cephalops aucta Fallen, 1899, Wien. Ent. Zeit. V. 18, 137.

Verrallia virginica Banks, 1915, Psyche, 22, 169. New synonymy; this appears to be the same as the European species *auctus* (Fallen).

Male. Head: Eyes very narrowly separated along the front; lower one third of front and all of the face densely silvery pubescent; narrowed upper portion of front opaque black; occiput very narrow; hind margins of compound eyes not indented; antennae black, third segment rounding below, second segment bristly (fig. 5a). *Thorax:* (and abdomen) opaque black with rather dense black hairs and strong bristles; margins of thorax, pleurae and metanotum cinereous; lateral margins and narrow apices of abdomen faintly silvery; humeri brownish to black; halteres yellowish brown; propleurae each with a group of four to five long pale hairs on the anterior margin and another group of three to four hairs on the lower edge of the posterior margin; legs chiefly black; apices of femora and tibiae and bases of tibiae yellow; tarsi yellow to brown; femora narrow, rather thickly yellow haired but bristles not well developed; sides of abdomen almost straight, gradually narrowing from the first segment posteriorly; lateral margins densely haired, pile pale and dark intermixed; second segment about equal to fifth in length; third and fourth shorter. *Wings:* Iridescent; third costal section slightly longer than fourth, stigma filling most of section; fifth section of costa much shorter than third and fourth combined, crossvein r-m situated beyond the end of the subcostal vein and just before the middle of the discal cell; appendix on fourth vein (M_{1+2}) rather short to medium in length, usually about as long as the dis-

tance from the posterior crossvein to the fork of M_{1+2} ; ultimate section of fifth vein longer than the posterior crossvein; cubital cell with a rather long petiole (fig. 5b). *Hypopygium*: Much the same as in *Chalarus* from dorsal view, there is no essential difference in the general make-up of the hypopygium; sixth segment plainly visible but short (in specimens studied), about one fourth to one fifth length of fifth segment; segment seven slightly longer than six and on left side of hypopygium; segment eight occupies left side of apex and nine is directed anteriorly up into the genital chamber with a pronounced carina down middle (fig. 5c).

Length: body, 4.5-5 mm.; wing, 4.8 mm.

Female unknown in America. The following description is from G. H. Verrall, 1901, *British Flies*:

"Not at all similar, but easily known by the fork in the terminal portion of the discal vein and by the short stigma. Frons nearly equal in width and all whitish except about the vertex; the bristles beneath the second antennal joint are pale; the back of the head is not puffed out.

"Thorax with abundant blackish pubescence, and with the strong chaetotactic bristles more conspicuous and all black; pteropleurae with slight soft pubescence.

"Abdomen less grey than in *V. pilosa* about the base, and with the grey side spots more confined to the hind corners and hind-margins of the segments, and with the pale pubescence about the sides of the second segment more confined to the base. Hypopygium longer but less thick than in *V. pilosa*, being not swelled out at the base beneath the fourth nor even the fifth abdominal segment.

"Legs with the bristles in front of the hind femora strong and black, though shorter and more numerous than in *V. pilosa*.

"Wings with the stigma shorter than the next segment of the costa, and with the middle cross-vein hardly after the middle of the discal cell. Squamae orange. Halteres dark orange.

"Length about $4\frac{1}{2}$ mm."

Species described from Europe. Fallen's type is possibly at Stockholm.

The type locality of *virginica* Banks is Glencaryn, Virginia. The writer has studied this specimen in the Cambridge Museum of Comparative Zoölogy, also specimens from Pringle, South Dakota, July 13, 1924, and Nantucket, Mass., August 19, 1927 (Johnson).

Prothechus csikii (Aczel)

Verrallia csikii Aczel, 1940, Zool. Anzeiger 1.12, Bd. 132, Heft 74, 152. Change of name for *Pipunculus opacus* Williston, (nec Fallen, 1816) 1886, Trans. Amer. Ent. Soc. XIII, 295.

Following is the original description of Williston's *opacus*:

"*Female*. Black, abdomen narrowly gray fasciate; face white; legs chiefly black; thorax with bristles; fourth longitudinal vein with a stump, crossvein near middle of discal cell, stigma small. Length 6 mm.

Front below and the face silvery white; front elsewhere black, grayish pollinose. Antennae black, third joint large, reniform, silvery on the front and inner side. Dorsum of thorax and scutellum black, apparently gray pollinose, with black pile, and on the postalar callosities and scutellum with black bristles, pleurae pollinose, abdomen depressed, opaque black, the posterior margin of the segments narrowly, and the sides, gray pollinose; along the sides in front with light yellow, behind with black pile. Legs black, femora gray pollinose; tip of femora, base and tip of tibiae and all tarsi yellowish white. Front, and especially the middle, femora behind with white pile, hind femora and tibiae with fine bristly hairs. Wings nearly hyaline, stigma small, brown; anterior crossvein near middle of discal cell, last section of fourth vein angulated and with a stump.

One specimen, Washington Territory."

Location of type unknown.

The writer has not seen this species.

Jassidophaga Enderlein

Jassidophaga Enderlein, 1936, Diptera Tierwelt Mitteleuropas, Bd. VI, 3, p.

This genus was erected to include those DORILAIIDAE having the ocellar bristles well developed, occiput scarcely developed, head hemispherical and the fourth vein (M_{1+2}) normal, without an appendix beyond the posterior crossvein. This has been separated from *Prothechus* wholly on the basis of the presence or absence of the appendix on the fourth vein and whether it should stand as a distinct genus is entirely controversial. It is not uncommon to find specimens of *J. pilosa* (Zett.) which have a very short appendage on the fourth vein.

Genotype: *Jassidophaga pilosa* Zetterstedt, 1840, Insect Lapponica, 579 (Pipunculus).

The two North American species may be distinguished by the following characters:

- A. Third section of the costa at least twice as long as the fourth.
Female ovipositor rather short and thick, seventh abdominal segment not prolonged.....*pilosa* (Zetterstedt), p. 31
- AA. Third section of costa about equal to fourth in length, female ovipositor long and slender, seventh abdominal segment prolonged, serving to elongate the base of the ovipositor,
fasciata (Hardy), p. 29

Jassidophaga fasciata (Hardy)

(Plate 1, figs. 6a-d)

Verrallia fasciatus Hardy, 1939, Journ. Kans. Ent. Soc. V, 12, No. I, 16-17.

The following is the original description of the female:

"This species appears to more closely approach *pilosa* (Zett.) than *virginica* Banks but differs markedly from this species in having the fourth section of

the costa longer than the third, stigma not over one-half the length of the fifth section; bristles all black; front silvery; ocellar bristles strong; halteres yellow; humeri black; piercer of ovipositor longer, more slender and femora without tuberosity.

"Female. In addition to the above characters the first two segments of the antennae are black, the second with stout black bristles above and fine, long, yellow pile beneath; the third segment brown and reniform, with a fringe of yellow-white pile (fig. 6a). *Head:* Face and front silvery, this being brought about by the dense covering of silvery pubescence. Face convex from lateral view. Front slightly narrowed at the halfway point between antennae and the vertex, the sides not being parallel as in *pilosa*. Occiput chiefly silvery but scarcely visible from side view.

"Thorax: Opaque gray, slightly brownish on the posterior half of mesonotum. Pleurae, metanotum and scutellum, also posterior one-half of each abdominal segment, silvery gray. Bristles of the thorax strong, four pairs of the scutellum; all bristles black except for two to three pairs of notopleurals which are yellow. Dorsum with rather abundant yellow pile. *Legs:* Coxae, trochanters and femora black with gray pollen, extreme tip of femora, tibiae and tarsi yellow, last two tarsal segments brownish. Femora without tubercles or strong bristles, but with numerous rows of long yellow hairs.

"Abdomen: Slightly tapering, as viewed from above, widest at segments one and two. First two segments opaque brownish on their anterior halves, segment two one and one-third times longer than third. Segments three, four and five subopaque black anteriorly, fifth segment one and one-fourth times longer than fourth and about equal to sixth; sixth tergite somewhat pointed on its posterior margin. Segments six and seven entirely gray dusted, faintly shining, seventh protruded, long and narrow, serving to elongate the base of the ovipositor. First abdominal segment entirely yellow pilose, densely haired on the sides; second segment chiefly so, with one row of black hairs on the posterior border, hairs of abdomen otherwise black. Ovipositor elongate, gently tapering from the base into a long narrow piercer (figs. 6c-d) extending beyond anterior portion of third segment.

"Wings: Hyaline, faintly iridescent; third costal section three-fourths as long as fourth. Stigma brown, almost completely filling third costal section. Third and fourth costal section equal to or little longer than fifth. Ultimate section of fourth vein slightly sinuate, last section of fifth longer than posterior crossvein. Anal (cubital) cell with a long petiole. Crossvein r-m at about middle of the third costal section and before middle of discal cell.

"Length: Wing, 5 mm.; body, 4.3 mm."

Male. The male has not been definitely associated with the female; however, the specimen at hand compared in all respects with the type female. Compound eyes very narrowly separated on the front; lower one third of front silvery pubescent, upper two thirds subshining to opaque black, mesonotum very densely pilose, more opaque black, not so grayish as in the female and the abdominal vittae are not so pronounced. *Genitalia:* The sixth tergum is dorsal in position, not at all twisted to the left; the seventh

is well developed and largely on the left side, extending on the dorsum to the ninth segment; the eighth segment is rounding and symmetrical, occupying the left side of the apex; the ninth segment is cleft dorsally, as in *Chalarus* and occupies the right side of the hypopygium; the sclerite separating the ninth from the eighth extends longitudinally just to the right of a middle line (fig. 6b); the ninth segment is cleft almost to base from ventral view; the harpagones are flattened laterad, broad at apices and densely haired; no distinct articulation has been observed between the claspers and ninth segment.

Type locality: Durango, Colorado.

Type in Snow Entomological Collection.

The male described above is from Ruidoso, New Mexico, June 28, 1940 (D. E. Hardy).

Jassidophaga pilosa (Zetterstedt)

(Plate 2, figs. 7a-c)

Pipunculus pilosa Zetterstedt, 1840, *Insecta Lapponica*, 579.

This European species is the most common species of the genus found in America. In the material which has been examined all degrees of intergradation have been observed from *pilosa* Zett. (possessing a distinct wart on the hind femora) to *villosa* v. Ros. (having no sign of a wart on the femora); in the males it is sometimes entirely lacking on one femur but fairly distinct on the other. No structural difference other than the slight variation in the development of this tubercle has been seen and they certainly do not appear to be distinct species; the *villosa* of Europe apparently does not occur in America.

Male. Head: Eyes very narrowly separated on the front, almost converging at the middle of the distance from the antennae to the ocelli; face and lower one third of front silvery; mouthparts yellowish tinged; first two joints of antennae brown to black, second segment bristly, with long yellow bristles below and shorter dark bristles above; third segment yellow-brown, more yellowish around margin, densely pale pubescent. *Thorax:* Opaque black to subshining with rather thick pale to black pile and marginal bristles; pleurae and metanotum grayish; humeri and halteres brown with yellowish tinge; pteropleurae pilose above, propleurae with a brush of five to six dark hairs; legs chiefly black, yellow on apices of femora and bases of tibiae; tarsi brownish; femora slender, with no distinct bristles below but with long serial hairs on sides. In typical *pilosa* the posterior femora have a distinct wartlike tubercle beneath

at about middle. Abdomen opaque black to subshining, lateral margins grayish, densely pilose. *Wings*: Faintly brownish, third section of costa twice as long as the fourth, stigma almost completely filling third section, fifth section of costa about equal to the third; crossvein r-m situated much beyond the end of the subcostal vein and at about the middle of the discal cell; ultimate section of fourth vein slightly sinuate, last section of fifth vein slightly longer than posterior crossvein; cubital cell with a long petiole (fig. 7b). *Hypopygium*: Very much like that of *Prothechus auctus* (Fallen) the sixth segment is longer, being more than one-half the length of the fifth and the ninth is slightly grooved longitudinally (fig. 7a) instead of being so distinctly carinated.

Length: body, 4.5 mm.; wing, 4.8 mm.

Female. Face entirely silvery, thorax and abdomen cinereous, brownish in ground color. Humeri and legs yellowish tinged, halteres yellow. Tubercle on hind femora, beneath, much more distinct than in male, sometimes with a small wart on the underside of the middle femora. Pile of thorax entirely yellow. Ovipositor rather short and broad (fig. 7c). Posterior portion of abdomen swollen; the sterna distended, with stout black bristles in addition to the long yellow hairs. Slightly smaller in size than the males.

Length: body, 3.8 mm.; wings, 4.8 mm.

Originally described from Europe.

Type in Zoölogical Museum, University of Lund.

The writer has seen this species from Randolph, New Jersey, June 20, 1925; N. Adams, Mass., June 19; Eastport, Maine, July 16, 1909; Mt. Greylock, June 15, 1906, (Johnson); Auburndale, Mass., June 24 (Johnson); Halfway H. Mt., W. New Hampshire, July 6, 1904; Buttonwoods, New Hampshire, June 26, 1913, (Johnson); S. W. Harbor, Maine, June 16, 1921, (Johnson); Mt. Equinox, Vt., June 5, 1910, (Johnson); Bar Harbor, Maine, June 7, 1921, (Johnson); Franconia, New Hampshire (Mrs. Slosson); and Foot Cliff Mt., Essex, Covey Hill, Que., June 17, 1924, (C. H. Curran).

Chalarus Walker

Chalarus Walker, 1834, Entom. Magaz., II, p. 269.

Ateleoneura Macquart, 1834, Rec. Soc. Sci. Lille, 356. (*Ateleoneura* Scudder).

This is perhaps the most easily recognized genus of DORILAIIDAE because of its peculiar wing venation. The fourth vein (M_{1+2}) extends just beyond the r-m crossvein then disappears, median crossvein (posterior) is entirely lacking so there is no closed discal cell in the wing, the anal vein is also obliterated. If a specimen is held

in the light just right the faint outline of the missing veins and crossvein can be seen. The third antennal segment is reniform to oval. Head hemispherical with the occiput narrowly visible from side, hidden by the margins of the compound eyes; ocellar bristles distinct, eyes of male dichoptic. Small, rather densely haired specimens. The segmentation of the genital portion of the abdomen is clearly demonstrated in this genus as all of the segments (1-9) are visible from dorsal view. The twisting towards the left side is just beginning and from this point the evolution of the torsion of the genital segments can be traced up through the higher genera. The ninth segment of male is divided longitudinally by an elongate split that extends down the middle about to base on dorsum.

Genotype: Pipunculus holosericeus Meigen.

Only one species has previously been known from North and South America and this is the common European species *spurius*. After studying a large series of specimens and comparing with typical *spurius* the writer has come to the conclusion that two species are present in North America. These may be separated by the following characters:

- A. Eyes of male widely separated; frons about as broad as ocellar triangle; one or two pairs of rather strong frontal bristles; each harpagone produced into a rounding development on inner margin below apex (fig. 8c); females rather thickly haired with mesonotal and scutellar bristles yellow.....*latifrons* n. sp., p. 33
- AA. Eyes of male very narrowly separated on the front, almost touching; frontal bristles weak; processes of inner margins of harpagones acutely pointed and situated just beyond middles (fig. 9c); females rather sparsely haired; mesonotal and scutellar bristles black*spurius* (Fallen), p. 36

Chalarus latifrons n. sp.

(Plate 2, figs. 8a-c)

This species is distinguished from *C. spurius* by the broad front of the male, the eyes being separated about the width of the ocellar triangle; one to two pairs of rather strong frontal bristles are present; the third antennal segment is almost twice the size of the second; each harpagone is produced into a rounding point just below the apex on inner side instead of an acute process just beyond the middle of the harpagone as in *spurius*; the harpagones are also rather thickly covered with long hairs; species slightly larger, more velvety black. The females appear to differ from *spurius* in being more thickly haired with all body bristles yellow. It appears to be largely confined to Western United States but specimens are

at hand from the East. Specimens received from Germany compare with this species so it may prove to be as extensively distributed as *spurius*.

Male. Rather densely covered with strong, dark bristles. *Head*: Frons about equal to the width at antennae, very slightly narrow in middle; face and lower one fourth to one third of front densely silvery pubescent; upper portion of front opaque black, subshining near vertex; face slightly gibbose; labellum yellowish; palpi black, enlarged and rounding at apices; antennae black, third segment comparatively large and almost oval (fig. 8a). The thorax, legs and wings are typical of the genus. Dorsum strongly bristled, pleurae almost bare, pteropleurae with a few weak hairs on anterior margins; humeri black, halteres black to slightly yellowed; femora and tibiae armed with several rows of conspicuous long hairs; legs entirely black. *Wings*: Third section of costa about four times the length of fourth; stigma light brown, filling most of third section. *Abdomen*: Opaque, rather velvety black, slightly rounding at the sides, widest at segments two to three; terga six and seven well developed and dorsal in position, seventh tergum a little more than one half the length of the eighth; sides of abdomen strongly bristled. *Hypopygium*: Eighth segment rather small, scarcely longer than the seventh; occupying the apex of the abdomen on the left side; the suture separating the eighth from the ninth is almost vertical and situated at about the middle of the apex. In *C. spurius* this suture is more to the right side. The ninth segment is rather large and elongate, occupying the right side of the apex and extending almost to base of sixth terga, from dorsal view; the ninth is not so well developed in *spurius* and extends beneath the apex of sixth tergum. The dorsal splitting of the ninth segment is plainly visible, especially in relaxed specimens; in dry material it may appear as a longitudinal ridge down the middle (fig. 8b); from ventral view the ninth segment is deeply cleft, 'U' shaped, on hind margin; the harpagones are broad and rounding, each with a small obtuse development on inner margin just below apex and another small process near base; harpagones thickly haired. Processes of ninth segment extending beyond apices of harpagones and plainly visible from ventral view (fig. 8c).

Length: body and wings 2.7-3 mm.

Female. Front slightly wider than in the male, entirely silver pubescent; not so densely haired on the dorsum; all bristles yellow except those on the dorsal portion of second antennal segment and

vertex. Halteres yellow. Base of ovipositor rounding, piercer almost twice as long as base, extending to about base of fifth abdominal segment. Otherwise like the male.

This species probably parasitizes a number of species of leafhoppers. It has been collected in sedges and tall grass meadows and flying over *Quercus vaccinifolia*. In the latter case possibly associated with Agalian leafhoppers; on willow near stream probably parasitizing *Empoasca* sp?. Taken in alfalfa at Austin, Nevada and *Ceanothus* at Sequoia National Park.

Holotype ♂: Chiricahua Mts., Arizona, July 4, 1940 (D. E. Hardy); allotype ♀, same locality and date (R. H. Beamer). One hundred and forty-six paratypes from the following localities:

Arizona: Same locality and date as type (R. H. Beamer, D. E. Hardy); Patagonia, June 24, 1933 (R. H. Beamer).

British Columbia: Kimberly, July 29; Cranbrook, June 27.

California: Strawberry, August 8, 1929 (P. W. Oman); Palm-dale, July 1940 (R. H. Beamer, D. E. Hardy); Onyx, July 23, 1940 (E. E. Kenaga); Echo, August 10, 1940 (R. H. Beamer, D. E. Hardy); Yosemite National Park, August 1, 1940 (R. H. Beamer, L. J. Lipovsky, D. E. Hardy, L. C. Kuitert); Cuyamaca Mts., S. Diego Co., Aug. 16, 1914 (J. C. Bradley); Pacific, Aug. 9, 1940 (R. H. Beamer, D. E. Hardy); Sequoia National Park, Aug. 6, 1940 (R. H. Beamer, D. E. Hardy); Mammoth Lakes, July 29, 1940 (D. E. Hardy).

Colorado: Maybell, Aug. 18, 1940 (E. E. Kenaga).

Kansas: Lawrence.

Massachusetts: Holliston, July 18 (Banks).

New Mexico: Clouderoft, June 27, 1940 (R. H. Beamer, D. E. Hardy, L. J. Lipovsky).

Nevada: Austin, Aug. 12, 1940 (R. H. Beamer, E. E. Kenaga, D. E. Hardy); Fallon, Aug. 12, 1940 (E. E. Kenaga).

Ohio: Columbus, May 28, 1925 (R. H. Painter).

Utah: American Fork, May 28, 1940 (G. F. Knowlton, G. S. Stains); Provo, Aug. 26, 1938 (G. F. Knowlton); Joseph, June 30, 1940 (G. F. Knowlton, F. C. Harmston); Kanosh, July 12, 1940 (F. C. Harmston); Mt. Home, July 19, 1940 (G. F. Knowlton, F. C. Harmston); Current Creek, June 11, 1933 (G. F. Knowlton); Price, July 21, 1940 (G. F. Knowlton, F. C. Harmston); Avon, July 9, 1939 (F. C. Harmston, G. S. Stains); Heber, May 19-Aug. 17, 1939-1940 (R. H. Beamer, G. F. Knowlton & F. C. Harmston); Logan Canyon, August 28, 1938 (G. F. Knowlton, D. E. Hardy, G. S. Stains); at light, Logan, July 9, 1940 (G. F. Knowlton, G. S. Stains).

Virginia: Falls Church, May 7, (Banks); Chain Bridge, June 23 (N. Banks).

Paratypes being returned to Utah State Agricultural College; Cambridge Museum of National History; Kansas State College and Cornell University, all other types in Snow Entomological Collection.

Charlarus spurius (Fallen)

(Plate 2, figs. 9a-g)

Cephalops spurius Fallen, 1816, Diptera Sueciae, I. Syrphici 16.

Male. Head: Ocellar bristles distinct; frontal bristles rather weak; occiput scarcely, if at all, visible from side view, usually covered by the broad hind margin of the compound eyes; compound eyes about twice as high as wide, not noticeably indented on hind margin; antennae brown to black, third segment scarcely larger than the second, reniform in shape (fig. 9a); eyes narrowly separated on the front; front scarcely as wide as median ocellus; lower one third of front silvery; upper two thirds opaque brownish. *Thorax:* Opaque to faintly shining with grayish pruinosity; dorsum of thorax, scutellum (as well as abdomen) rather thickly covered with long, pale to black pile; margins of mesonotum and scutellum with strong black bristles; pleurae chiefly bare; pteropleurae with a few weak hairs on anterior margins; propleurae with two strong yellow bristles on their anterior margins (only visible after head has been removed; humeri and halteres brown, sometimes with a faint yellowish tinge; legs brown to black, tarsi slightly yellowish, in some specimens the legs have a yellowish tinge. *Wings:* Lightly iridescent; third costal section four to six times as long as fourth, stigma filling apical two-thirds of third section; fifth section of costa shorter than third; costa extending to just beyond the end of R_{1+2} ; crossvein r-m situated just slightly beyond the end of the subcostal vein; base of anal vein usually distinct, apical portion faint to entirely obliterated (fig. 9b). *Abdomen:* Opaque, faintly shining in ground color, lightly gray dusted. *Hypopygium:* The sixth abdominal segment is normal in appearance, not twisted to the left to form the basal plate of the hypopygium; on its right side, however, it apparently serves as a protective pouch for the incurved ninth segment and intromittent structures; segment seven well developed, occupying the left side of the hypopygium and about as large as eighth; eighth situated at apex slightly on left side, and together with segment seven makes up main part of genital chamber; ninth segment directed anteriorly and fits up under sixth segment, in resting position (fig. 9c); suture separat-

ing eighth from ninth is to right of apex and the ninth disappears from view near basal portion of sixth segment (fig. 9d). There is no direct line of articulation between the harpagones and ninth segment and a small acutely pointed lobe is present on inner margin of each harpagone below the apex (figs. 9c and e).

Length: body, 2-2.5 mm.; wing, 2.1-2.6 mm.

Female. Like the male, except for the broad front; the legs and halteres more consistently yellow tinged; ovipositor short thick and curved, base small, opaque; piercer extending just past posterior edge of fourth segment and polished (figs. 9f, g); sterna of abdomen are larger and more conspicuous than in the male.

Species originally described from Europe.

Type probably at Stockholm.

This species is more abundant in Eastern United States; following are the states from which it has been identified: Arizona, California, Illinois, Kansas, Massachusetts, Michigan, New Mexico, Nevada, New Hampshire, New Jersey, New York, Ohio, Pennsylvania, South Dakota, Texas, Utah, Vermont and Virginia; also Saskatchewan and New Brunswick, Canada.

This species is said to be parasitic upon *Typhlocyba rosae* in Europe, no record has been made of this in America but its host is no doubt a species, or any number of species of small leafhoppers, such as *Typhlocyba* or *Erythroneura*. It has been taken in large numbers in willow, probably associated with *Empoasca*.

Protonephrocerus Collin

Protonephrocerus Collin, 1931, Diptera of Patagonia and South Chile, Part VI, Fasc. 2, p. 52.

Following is the original description of this genus:

"Agreeing with *Nephrocerus* in having a deep excision at middle of hind margin of each eye, a strongly bristled thorax and scutellum, and discal vein forked. Differing in having third antennal segment not reniform but similar to that of some species of *Pipunculus*, no cilia on prothoracic episterna, a small pteropleural bristle beneath root of wing, no prominent lobes to last abdominal sternite in female, a fringe of long hairs behind middle femora as in some species of *Pipunculus*, stigma darkened, and no axillary lobe to wing, the wing-margin here being formed by the anal vein."

Genotype: *Protonephrocerus chiloensis* Collin.

"Type locality: Ancud, Chiloe I., Chile."

Nephrocerus Zetterstedt

Nephrocerus Zett., 1840, Ins. Lap. 578.

The members of this genus are the largest of the Dorilaidae, they are most easily recognized by the well-developed bristles on the

scutellum and margins of the mesonotum; the large reniform third antennal segment (*scutellatus* Macquart of Europe has the third segment small); the inflated humeri and scutellum and the strongly indented posterior border of the eyes (fig. 10a). The head is nearly spherical and the ocellar bristles are lacking as in *Dorilas*. They are Syrphid-like in appearance, especially reminding one of members of the genus *Sphaerophoria*. They have one to two pairs of dorso-central bristles, two bristles on postalar calli, one to two supra-alars and two posthumeral bristles; above front coxae toward the prothorax there is a row of about eight bristles; scutellum with four to eight marginal bristles.

They have been recorded as possible parasites of CICADIDAE, but the writer has been unable to confirm this; it seems highly illogical but until their life history is studied it will remain questionable. It seems probable that these may parasitize FULGORIDAE, or perhaps large CICADELLIDAE such as *Gypona*.

Genotype: *Nephrocerus lapponicus* Zetterstedt, 1840, *Insecta Lapponica*, p. 578.

Only two American species are known, these may be separated by the following characters:

- A. Abdomen with two distinct yellow bands, one at the junction of segments two and three and the other at segments three and four; front of female very narrow above, eyes almost contiguous. *daecke*i Johnson, p. 38
- AA. Abdomen indistinctly banded in male, the lateral margin yellow in female, upper half of front widely separated in both sexes. *slossonae* Johnson, p. 39

Nephrocerus daeckei Johnson

(Plate 2, figs. 10a-c)

Nephrocerus daeckei Johnson, 1903, *Ent. News*, XIV, 107-108.

The following is the original description of the male:

"*Male*. Face and front black, covered with a silvery white pubescence; occiput with white pubescence and hairs; antennae entirely light yellow, aristae black. Dorsal portion of the thorax a shining black; humeri, lateral margins, pleurae and scutellum, light yellow; the anterior portion of the thorax, in certain light, shows a whitish sheen; a pair of bristles on the ante-alar and post-alar callosities, and four on the scutellum. Abdomen black, shining; the posterior edge of the second and third segments narrowly margined with yellow; a small yellow spot bearing a tuft of black bristles on the sides of the first segment, the remaining segments with more or less prominent hairs and bristles especially along the sides of the posterior margins; genital portions dark yellow; halteres yellow, the knobs narrowly margined with brown above. Legs light yellow. Wings hyaline, with a very slight brownish tinge. Length, 6 mm."

Female. Head: Posterior margin of eyes strongly indented, occiput narrow; front, face and occiput silvery pubescent; antennae and mouthparts bright yellow; base of arista yellow, otherwise black; third antennal segment almost oval (fig. 10a); pile of occiput yellow; front very narrow almost contiguous on upper half. Thorax, legs and abdomen as in the male. *Wings:* Humeral crossvein vertical, third section of the costa short, about one fifth the length of the fourth section; no darkening in the stigmal area; crossvein r-m situated at about the basal one sixth of the discal cell; appendix of fourth vein (M_2) long, almost reaching to wing margin; vein M_{3+4} ending before the margin, about half way from m crossvein to margin (fig. 10b). *Genitalia:* Ovipositor short and bladelike reaching about to the end of the sixth sternum, yellow in color. Sixth sternum forming a broad plate beneath the ovipositor, this is thickly covered with short tacklike spines, especially numerous on the posterior portion (fig. 10c).

Length: body, 7-7.5 mm.; wing, 7.5-8 mm.

Type locality, Richmond Hill, L. I., New York.

Type at Boston Society of Natural History.

The writer has examined specimens from Rock City, N. Y., Cattaraugus Co., 9 June, 1915; Roxborough, Pa., VI-28-08; Richmond Hill, Long Island, July 2, 1901, (C. W. Johnson); Plummers Island, Maryland, 29-6-13 (R. C. Shannon); Franconia, New Hampshire (Mrs. Slosson).

Nephrocerus slossonae Johnson

Nephrocerus slossonae Johnson, 1915, Can. Ent. v. XLVII, 55-56.

This species differs from *daeckei* in having the abdomen entirely polished brown, without apices of segments two and three, yellowed. Pile of abdomen more erect, pale long and irregular instead of dark, slightly procumbent, shorter and more evenly placed pile as in *daeckei*. Scutellum of *slossonae* with an abundance of strong pale pile in addition to the two pairs of marginal bristles; only a few weak hairs in *daeckei*; *daeckei* with a small clump of black hairs on each coxae, above, these are yellow on *slossonae*. Third costal section of wing one third to one fourth the length of the fourth in *daeckei*, one fourth to one fifth in *slossonae*, the appendix of the fourth vein is also slightly longer in *daeckei*. Propleural brush yellow in *slossonae* with stronger brown hairs in *daeckei*.

The following is the original description of both sexes:

"*Male.* Face and front covered with silvery white tomentum, vertical triangle and occiput black, grayish pruinose, occipital orbits deeply emarginate,

mouth parts and antennae light yellow, arista black, the thickened base light yellow. Thorax, discal portion black, shining, the anterior third covered with a grayish bloom, humeri, broad lateral stripes, and the scutellum, yellow, the latter much darker than the humeri, pleura livid, a lighter area below the base of the wing bearing a small black spot, metanotum black. Abdomen black, shining, thinly covered with quite long yellow hair, with conspicuous tufts on the sides of the first segment, sides of the first and the posterior margins of the second and third segments brownish, hypopygium brown, the two large rounded glands diverted to the right, with a black, spirally coiled "flagellum" below. Legs and halteres light yellow, the long bristles at the end of the last tarsal joints four in number, posterior tibiae nearly straight, not noticeably thickened and without bristles. Wings long, narrow of nearly equal width, grayish hyaline, posterior branch of the fifth longitudinal vein scarcely reaching the margin, tegulae yellow.

Length 8 mm., wing 9 mm.

Female. Front narrow below the vertex gradually widening above the antennae, about four times its width at the vertex. Thorax similar to that of the male except that the pleura are light yellow with small black point below the base of the wing, and black spots between the coxae, disc of the scutellum and the metanotum blackish. Abdomen dark yellow, with an irregular, broad dorsal line of black constricted at the margins and covering about one-third of each of the first five segments, the fourth and fifth segments also narrowly margined posteriorly with black, sixth and seventh segments and the hooklike ovipositor entirely yellow.

Length 7.5, wing 8.5 mm."

Type locality: Bretton Woods, New Hampshire.

Type at Boston Society of Natural History.

The writer has examined specimens from the following localities: Mt. Wash., N. H.; Glen House, N. H., VI-15-14 (Johnson); Mt. Monadnock, N. H.; Bretton Woods, N. H., VI-28-13; Va. Highway Randolph, N. H., 2-VII (Banks).

Cephalosphaera Enderlein

Cephalosphaera Enderlein, 1936, *Diptera Tierwelt Mitteleuropas* Bd. VI, 3.

This is without a doubt the genus which Rondani described as *Prothechus* but as *Prothechus* is isogenotypic with *Verrallia* Mic, according to designated genotypes, the name is not available for use here.

This genus has been erected to contain those species of *DORILAIIDAE* having the head nearly spherical, no ocellar or well-developed mesonotal or scutellar bristles; occiput widely developed and the fourth vein (M_{1+2}) appendiculate beyond the posterior (m) cross-vein. It is split off from the old *Dorilas* (*Pipunculus*) by having the appendix on the fourth vein. Whether this should be considered a true genus or just a subgenus is somewhat questionable. On the

basis of the old (previous to Enderlein's paper¹⁸) generic concept in this family it certainly would not stand, but as it makes a very convenient grouping the writer is giving it generic ranking.

Genotype: *Cephalosphaera furcata* (Egger), 1860, Verh. Zoöl.-bot. Gesells Wien. 10, 347.

Only a single species (the genotype) was recognized in Europe at the time of the latest revision by Sack,¹⁹ however, Aczel²⁰ has recently described a second European species, *Cephalosphaera germanica*; the genus is fairly well represented in America. From a study of the available North American types it would seem that many apparently trivial characters have been overemphasized in this group and consequently several species have been difficult to place.

KEY TO KNOWN NORTH AMERICAN SPECIES

1. Third segment of antennae short, acute to obtuse below..... 2
Third segment of antennae long acuminate; if the third segment is shorter acuminate the hind tibiae of males end in an acute spur below..... 4
2. Pile of dorsum conspicuous and erect..... 3
Mesonotal pile short, appressed; humeri yellow.....*constricta* (Banks), p. 48
3. Femora chiefly black, only apices yellow; tarsi brown to black
stricklandi (Curran), p. 52
Legs chiefly yellow, femora only slightly blackened medianly
(México) *elegantula* (Williston), p. 50
4. Legs wholly yellow*biscaynei* (Cresson), p. 45
Only apices and bases of femora yellow, with broad black rings; tibiae usually brownish medianly 5
5. Males 6
Females 10
6. Hind tibiae terminating in an acute spurlike point below..... 8
Hind tibiae normal, without an apical development..... 7
7. Very large species (body 6.7 mm.; wings 7.4 mm.); crossvein r-m situated near middle of discal cell; hind trochanters with dense patches of long yellow hairs below; entirely opaque species; r-m crossvein curved.....*mazima* n. sp., p. 50
Rather small species (body 3.3-3.5 mm.; wings 3.8-4 mm); r-m near basal one-third to one fourth of discal cell; hind trochanters without long hairs; subshining species; r-m straight.....*brevis* (Cresson), p. 46
8. Third section of costa about half as long as fourth; membranous area of eighth segment extends toward the base of the segment; dorsum densely white pilose
tibialis n. sp., p. 53
Third section of costa much longer than fourth; hypopygium with a distinct apical cleft; chiefly bare species..... 9
9. Occiput very broad, about one third the width of the compound eyes from side view; apical cleft of hypopygium rather small but with a distinct basal cleft usually visible on right side; harpagones covered with strong hairs, broad and gently tapering, not enlarged apically.....*appendiculata* (Cresson), p. 43
Occiput normal, scarcely one fifth to one sixth as wide as eyes; apical cleft of hypopygium large and conspicuous, basal cleft not visible; harpagones more slender, slightly enlarged at apices and covered with thick short hairs
acuminata (Cresson), p. 42
10. Third section of costa less than half the length of fourth.....*tibialis* n. sp., p. 53
Third section equal or longer than fourth..... 11

18. 1936, Diptera Tierwelt Mitteleuropas Bd. VI, 3.

19. 1935, Die Fliegen der Palaarktischen Region, 32 Dorylaidae, Lief. 93, 1-57.

20. 1940, Zoöl. Anz., 1.12, 132, Heft 7/8, 168-169.

pygium about three fourths the length of fifth segment with a large apical depressed area; seventh sclerite scarcely visible from dorsal view; from ventral view the membranous area extends over half the length of the eighth segment on a middle line; the ninth segment is but little longer than the eighth on left side with a broad 'U' shaped cleft on hind margin extending almost half the length of the segment. Harpogones rather thick at bases, tapering apically, quite strongly curved on inner margins; apices slightly enlarged and somewhat squared; both harpogones thickly covered with short, dark bristles. Cerci moderately developed, extending well beyond apex of ninth segment (fig. 11d).

Type locality: Alamogordo, New Mexico.

Type at Philadelphia Academy of Natural Science.

The writer has studied the type series and has identified specimens from: Chiricahua Mts., Arizona, July 4, 1940 (R. H. Beamer, D. E. Hardy); Manhattan, Kansas, Sept. 27, 1931 (H. M. Smith); Glasco, Kansas, August 24, 1940 (R. H. Beamer) and Likely, B. C., July 8, 1938 (J. K. Jacob).

Cephalosphaera appendiculata (Cresson)

(Plate 2, figs. 12a-h)

Pipunculus appendiculatus Cresson, 1911, Trans. Amer. Ent. Soc. XXXVI, 296-297.

The females of *appendiculata* are easily recognized by the swollen occiput, and the males by the development of the apex of the posterior tibiae and the acutely pointed harpogones.

Male. Head: Front and face silvery pubescent, occiput cinereous, lightly grayed above; third segments of antennae acuminate (fig. 12a), brown to yellowish, thickly white pubescent; base of arista yellow; bristles on under side of second segment pale, very elongate, reaching as far as tip of third segment. *Thorax:* Subshining in ground color, densely brownish pollinose above, grayed on the sides of mesonotum, pleurae and metanotum; scutellum with fine brownish marginal hairs, mesonotum covered with short rather dense pile; propleurae with a conspicuous brush of long pale hairs on the hind margins; legs chiefly yellow, coxae broad, median bands of femora brown to black; tibiae sometimes discolored medianly, apical joints of tarsi brownish; femora moderately thickened, with well-developed flexor spines and series of long yellow hairs; posterior tibiae somewhat thickened medianly, terminating in an acute spurlike projection on under sides; hind tibiae each with a series of four to five long yellow hairs arising from just above the median line on outer surface

(fig. 12b); middle tibiae with a brush of dense, yellow hairs on apical one third, below (fig. 12c); posterior basitarsi about equal to the next three subsegments in length, fifth subsegment twice as long as the fourth. *Wings*: Lightly iridescent, third section of costa equal to decidedly longer than the fourth section, stigma completely filling third section; fifth costal section much shorter than third and fourth combined; crossvein r-m situated beyond the end of the subcostal vein and beyond basal one third of the discal cell; fork of fourth vein located about the length of the last section of the fifth vein from the posterior crossvein (fig. 12h). *Abdomen*: Sides broadly rounding, widest at about segment three; subopaque to nearly shining, dusted with brown pollen; first tergum and lateral margins of other segments cinereous; fifth tergum with the gray extending dorsally in the form of two large spots interrupted with brown in the middle; sides of all segments with scattered pale pile. *Hypopygium*: Subshining, about three fourths length of the fifth segment, slightly compressed to the right and with a distinct apical cleft (fig. 12f). Ninth segment and harpagones blackish; sixth and seventh segments twisted ventrad (fig. 12e), placing this species along with *constricta* (Banks) as the most highly specialized members of the genus. From ventral view the ninth segment is about as broad as long, about two times as long as sclerotized portion of eighth on left side; apical cleft of ninth segment broadly 'U' shaped. Harpagones very broad at bases, gently tapering and acutely pointed at apices; covered with strong dark hairs. Cerci slender, reaching just beyond apex of ninth segment (fig. 12g).

Length: body, 4.4 mm.; wings, 5.5-6.2 mm.

Female. Front entirely silvery except for small shining portion at vertex; occiput very broad and puffed out, two to three times as wide as face below antennae and about one fourth as wide as compound eyes through middle from lateral view. Thorax and abdomen more cinereous, the later with a median stripe of subshining brown. Ovipositor yellowish, base elongate, piercer about equal to and tapering from its base (fig. 12d); ovipositor extending to apex of first abdominal segment.

Length: body, 3.8-4.5 mm.; wings, 5.0-5.6 mm.

Type locality: Manchester, Vermont.

Type in Boston Society of Natural History.

The writer has examined the type series and has a homotypic male from Ithaca, N. Y., May (C. W. Johnson). The species has also been identified from: Rock City, New York, Cattaraugus Co.,

June 9, 1915; Pocono Lake, Pa., July 12, 1911; Balsam Mts., North Carolina, August 23, 1930; Lavender, Floyd Co., Ga., Aug. 23, 1910 (J. C. Bradley); Mt. Equinox, Vt., July 9, 1910 (Johnson); Wellfleet, Mass., Aug. 18, 1919 (Johnson); Mt. Washington, N. H., July 24, 1915 (Johnson); Sioux City, Iowa (C. H. Ainslie); Morgan, New Jersey, Aug. 7 (Wiess, West).

Cephalosphaera biscaynei (Cresson)

(Plate 3, figs. 13a-d)

Pipunculus biscaynei Cresson, 1912, Ent. News, XXIII, 453-454.

This species is easily recognized by its bright yellow legs and distinctive genitalia.

Male. Head: Face and front silvery pubescent, eyes joined for one half of the length of the front; occiput opaque black above, silvery on the sides and below; first two segments of antennae brown, third segment yellowish to brownish-yellow in ground color, covered with long white pubescence and acuminate below; third subsegment of arista swollen basally (fig. 13a). *Thorax:* Subopaque, dusted with gray to brown pollen; metanotum and pleurae cinereous; humeri black, with yellowish tinge on margins; halteres pale, knobs slightly darker than stems; propleurae each with a brush of very long conspicuous yellow hairs; only coxae of legs black, otherwise bright yellow, last tarsal subsegment brown, hind femora faintly discolored above; femora slender, spines distinctly developed on apical halves of posterior femora; hind tibiae almost straight; all basitarsi equal in length to the next three tarsal subsegments. *Wings:* Faintly iridescent, third section of costa longer than fourth, stigma completely filling third section; fifth section about equal to third and fourth combined. Crossvein r-m at about the end of the subcostal vein and at about basal one third of discal cell; ultimate section of fourth vein with a strong appendix (M_{1+2} forked beyond posterior crossvein), the appendix situated almost the length of the last section of fifth vein from the crossvein; cubital cell with a short petiole (fig. 13b). *Abdomen:* Bases of segments velvety black, apices shining in ground color dusted lightly with gray above, cinereous on the sides; segment five almost completely cinereous on apical half only narrowly interrupted by a shining median area; sides of abdomen almost straight, segments two to four about equal in length; segment five about twice as long as four. *Hypopygium* about three fourths as long as segment five, with a median depression formed by the edges of the eighth seg-

ment coming together on the dorsum and with a distinct apical keel (fig. 13d).

Length: body, 3-4 mm.; wings, 4-4.5 mm.

Female. Antennae more yellow, front silvery above antennae, shining black on upper one half (in the type female the front is mostly shining). Abdomen subshining in ground color, densely cinereous on the sides and apices of segments two to five, except for median interruption of shining black; segments one and six cinereous. Piercer of ovipositor slightly longer than its base, reaching to about middle of second abdominal segment; base somewhat rounding (fig. 13c). The description of the type states "ovipositor reaching to base of abdomen;" examination of this specimen revealed that the ovipositor was not quite this long.

Type locality: Biscayne Bay, Florida.

The writer has examined the type (♀) at Philadelphia Academy of Science, also specimens from Great Falls, Virginia, June 5 (N. Banks); Grand Rapids, Michigan, July 5, 1937 (M. S. C.); Elgin, Alabama, July 6, 1939 (D. E. Hardy) and Douglas Co., Kansas.

Cephalosphaera brevis (Cresson)

(Plate 3, figs. 14a-d)

Pipunculus brevis Cresson, 1911, Trans. Amer. Ent. Soc. XXXVI, 303-304.

Pipunculus eronis Curran, 1927, Can. Ent. 59, 290. New synonymy based upon comparison of type of *brevis* with the original description of *eronis* and upon descriptive notes on Curran's type made by Doctor W. J. Brown.

There are no diagnostic characters in the description of *eronis* that will distinguish it. Curran separates it from *appendiculata* by "third antennal segment yellowish" leading to *eronis*, "third antennal segment brown" keying out *appendiculata*; and from *brevis* by "scutellum without hairs" equalling *brevis*; "scutellum with black and pale hairs on margin" keying out *eronis*. Examination of the type shows that *appendiculata* has the third segment yellowish and runs directly to *eronis* in Curran's key; all the specimens examined have had hairs on the scutellum; check of the width of the occiput of the type female of *eronis* indicates that it is probably the same as *brevis*.

This species is related to *acuminata* (Cresson) and *appendiculata* (Cresson); comparison of the types of *acuminata* and *brevis* brought out no characters which would separate the females conveniently, the differences in the length of the sixth abdominal segments may be due to the degree of extension and the curvature of the ovipositor may be rather slight. The males have not yet been definitely associated but the specimens described here appear to belong to this species.

The following is the original description of the type female:

"Front and face silvery, only extreme vertex shining; occiput white; second antennal joint brown, third yellow, long white acuminate. Mesonotum subopaque, brownish medianly, cinereous laterally, scutellum not shining, brownish-black, without hairs; humeri black, halteres yellowish, apices of knobs brown. Pleurae and metanotum cinereous. Abdomen shining to subopaque, grayish tinge at apices of segments; apical margin of first broadly white and broadly interrupted medianly; entire lateral margins of second and apical lateral angles of following segments cinereous; fifth segment longer than sixth. Ovipositor yellow, gradually tapering from the elongo-globose, cinereous base, straight or slightly curved down, extending to base of second ventral segment. Legs yellow, coxae, broad median rings on femora, and apical tarsal joints blackish; inner surface of post-femora polished; post-tibiae normal; apical and basal joints of post-tarsi in proportion 1:2; femoral spines distinct apically. Wings short hyaline, with colored stigma. Length 3.5 mm.; wings, 4.0 mm."

A series of male specimens at hand appear to belong to this species. They have not been collected with the females so the identification is not positive. The following is a description of this material.

Male. Very near to *appendiculata* (Cresson) but lacking the spurlike projection on the hind tibiae and possessing distinctive genital characters. *Head:* Third antennal segment yellowish to brown, acuminate (fig. 14a) covered with dense, white pubescence; front and face silvery; occiput cinereous below, light gray on upper part. *Thorax:* Subshining in ground color, densely brown dusted above, grayed on the sides; pleurae and metanotum cinereous; mesonotum with sparse, short hairs; propleurae with a brush of long pale hairs on hind margins; humeri black; halteres yellow; legs as in female. *Wings:* About the same as *appendiculata*; the third costal section is about equal in length to the fourth; the stigma completely filling third section; the fifth section of the costa equals the length of the third and fourth combined; crossvein r-m is situated at about the basal one third of discal cell and beyond end of the subcostal vein; fork of fourth vein located about one third the length from the posterior crossvein to the wing margin (fig. 14b). *Abdomen:* Subshining in ground color; bases of segments opaque black, apical one half to three fourths of segments brownish pollinose with rather narrow faint to distinctly gray vittae on the apical margin, more pronounced on segments one and five; lateral margins grayed; sides of abdomen slightly rounding; segment five almost twice as long as segment four. *Hypopygium:* Developed about three fourths as long as fifth segment, with segments seven, eight and nine plainly visible from dorsal view; also with a small, scarcely visible apical keel (fig. 14c).

Length: body 3.5-4 mm.; wings, 4-4.5 mm.

Type locality: Norwich, Vermont.

Type in Boston Society of Natural History.

The writer has studied the type and has examined specimens belonging apparently to this species from: Berrien Co., Stevensville, Mich., May 29, 1936 (G. Steyskal); Great Falls, Va., June 29 (Banks); 3 mi. N. Ledyard, Iowa, Aug. 7, 1928 (G. O. Hendrickson); McIntosh, Minn., Aug. 11, 1939 (R. H. Daggy); Traverse Co. (O. W. Oestlund); Ft. Snelling, July 10, 1929 (A. T. Hertig); Manhattan, Kan., Sept. 22 (R. H. Painter) and Crawford Co., Kansas, 993 ft., 1915 (R. H. Beamer). One specimen from Douglas Lake, Michigan, July 3, 1928 (M. W. Boesel) runs here but the hypopygium is more like *biscaynei* Cresson; male specimens from Aylmer, Que., Aug. 26, 1924 (C. H. Curran) fits the description except that the membranous portion of the eighth segment is expanded into an apical keel.

Cephalosphaera constricta (Banks)

(Plate 3, figs. 15a-e)

Pipunculus constrictus Banks, 1911, Trans. Am. Ent. Soc. XXXVI, 306-307.

This species is very near *elegantula* (Williston), the original description of which would seem to differ in having the mesonotum distinctly pilose and the femora somewhat blackish in the middle but as the male hypopygium was inadequately described it is difficult to know how much stress to place upon these characters.

Male. Head: Face and front silvery pubescent, eyes joined for about the length of the front; ocellar triangle shining, upper occiput dull black, sides and lower portion cinereous; antennae black, third segment acute to obtuse below (fig. 15a). *Thorax:* Mesonotum subshining in ground color, densely dusted with dull brown to black pollen, grayed on the margins; pleurae cinereous, metanotum faintly grayed, more distinctly so on upper margin; humeri bright yellow, stems of halteres yellow, knobs tinged with brownish; mesonotum almost bare, with only sparse, pale, appressed pile; propleurae with a row of long yellow hairs on anterior margins; legs, except black coxae, pale yellow, apical tarsal subsegments brownish; femora sometimes faintly discolored in the middle; femora moderately thickened, spines well developed and black; posterior tibiae slightly curved; basitarsi almost equal to next four subsegments in length. *Wings:* Hyaline, only faintly iridescent; third section of costa about equal to very slightly longer than fourth; stigma completely filling third section; fifth section about equal to third and fourth together;

crossvein r-m situated just beyond the end of subcostal vein and at about the basal one third to one fourth of discal cell; fourth vein strongly curved from r-m crossvein to posterior crossvein and also beyond the appendix; appendix of fourth vein slightly farther from posterior crossvein than the length of the last section of fifth vein (fig. 15b). *Abdomen*: Shining black, sparsely covered with short yellow hairs above; basal segments slightly constricted, abdomen widest at segments four and five. First abdominal segment longer than third, third and fourth about equal in length; fifth segment about one and one third times as long as fourth. *Hypopygium* about equal in length to fourth segment, slightly compressed to the right and with a distinct apical cleft (fig. 15d). Ninth segment and harpagones yellowish; both claspers rather slender and symmetrical (fig. 15e).

Length: body, 5.0 mm.; wings, 5.5 mm.

Female. Front entirely silvery, strongly narrowed above, near ocelli; halteres bright yellow; femora without discolorations, swollen and spinose as in male; posterior tarsi rather flattened, basitarsi about equal to next three subsegments. Ovipositor chiefly yellow, base large and somewhat swollen on under side; piercer long and slender, about two times as long as and abruptly terminating its base; reaching beyond anterior margin of second abdominal segment (fig. 15c); otherwise like the male.

Type locality: Black Mountain, North Carolina.

The writer has examined the type at the Cambridge Museum of Comparative Zoölogy and has seen specimens from the following localities.

Alabama: Tuskegee, 7-22-1930 (L. D. Tuthill).

Canada: No. 15.8 (Osten Sacken); Montreal, Quebec, June 11, 1919 (J. Quellet); Douglas Lake, Manitoba, June 15, 1925, (Cridle); Barber Dam, N. B., June 24, 1914, (F. M. McKenzie).

Florida: Ft. Augustine (Johnson).

Kansas: Douglas Co., 900 ft. May.

Minnesota: Plummer, June 3, 1938, (D. Denning).

New Hampshire: Franconia (Mrs. A. T. Slosson).

New Jersey: Pemberton, July 11, 1909; Wenonah, July 10, 1910.

North Carolina: Raleigh, IV-21-1926, (C. S. Brimley).

Oklahoma: Page, June 24, 1934, (A. E. Pritchard).

South Dakota: Canton, June 16, 1924.

Texas: Brownwood, VI-4-36, (R. H. Painter).

Cephalosphaera elegantula (Williston)

Pipunculus elegantulus Williston, 1892, Bio. Cent. Amer. III, 87.

The writer has not seen the type of this species and cannot be sure of its identity. The following is the original description:

"Frontal triangle and face black, silvery-pubescent. Antennae black; third joint silvery-pubescent, obtusely pointed below; arista black, thickened at its base. Dorsum of thorax and scutellum deep brown, moderately shining, distinctly pilose; pleurae and metanotum black, gray-pollinose. Abdomen deep black, shining, whitish, pilose; first segment and the posterior angles of the following segments opaque grey-pollinose; hypopygium large, black, moderately shining, reddish below, thinly pollinose. Legs yellow; all the femora more or less broadly blackish in the middle; distal joints of all the tarsi blackish; femora stout, on their under distal side with two rows of short black spines. Wings nearly hyaline; stigma yellowish; anterior cross-vein nearly opposite the tip of the auxiliary vein; last section of the fourth vein angulated, and with a stump; penultimate section of the fourth vein more than twice the length of the antepenultimate section. Length $4\frac{1}{2}$ millim."

Type locality: México, Chilpancingo in Guerrero.

Type in British Museum.

It is very probable that *P. stricklandi* Curran should be a subspecies or variety of *elegantula*. The writer has examined a specimen from Edmonton, Alberta, July 13, 1929, (E. H. Strickland) which fits this species perfectly.

Cephalosphaera maxima n. sp.

(Plate 3, figs. 16a-f)

This species is related to *brevis* (Cresson) but is distinguished by: its much larger size; the short third costal section in the females; the r-m crossvein in both sexes situated near the middle of the discal cell and at about the apical two thirds of the third costal section; the posterior crossvein is curved in the middle and the fifth section is about equal to fourth. The female ovipositor possesses a distinct tubercle on the base below and the apex of the male hypopygium is divided into two plates by the broad longitudinal membranous area.

Male. Very large, opaque, somewhat thickly pilose species. *Head:* Eyes joined on the upper two thirds of the front, frontal triangle dull black to silvery pubescent, face silvery; bristles of second antennal segment strong, those on under side reaching almost the length of the third segment; third segment very long acuminate (fig. 16a) chiefly brown, with a yellowish tinge to the point and upper margin. *Thorax:* Brownish pruinose on the dorsum; grayed on pleurae, sides of mesonotum, scutellum, and metanotum; metanotum evenly convex with no indication of a transverse furrow;

dorsocentral and marginal hairs distinct, propleurae with a conspicuous fan of long yellow hairs on posterior margins; humeri black, halteres yellow. *Legs*: Bases and narrow apices of femora yellow, all trochanters yellowish tinged, tibiae yellow except for faint median discolorations, tarsi brownish dorsally; middle and hind trochanters with dense clumps of fine yellow hairs below; femora with several rows of long fine hairs laterally and strong flexor spines below on apical halves; posterior tibiae arcuate, no distinct apical bristles on tibiae. *Wings*: Iridescent and elongate, third costal section about equal to fourth and also about equal to length of fifth section; crossvein r-m situated well beyond the end of the subcostal vein and almost at middle of discal cell; section of fourth vein from posterior crossvein to appendix about equal in length to the posterior crossvein; section beyond the appendix strongly curved; last section of fifth vein about equal in length to posterior crossvein. *Abdomen*: Sides almost straight, segments velvety black on anterior portions, brown to grayish pruinose on posterior margins; fifth abdominal segment almost twice the length of fourth. *Hypopygium*: Just slightly shorter than fifth abdominal segment with a very extensive membranous area extending to the base of the eighth segment. Eighth segment with a longitudinal groove or indentation near the left side of dorsum. Seventh sclerite scarcely visible from dorsal view (fig. 16d). From ventral view the ninth segment is longer than wide and equal to the length of the eighth; apical cleft "U"-shaped. Harpagones broad, acute at apices and somewhat concave on inner margins. Aedeagus very long and coiled. Cerci moderately developed, rather broad (fig. 16f).

Length: body, 6.7 mm.; wings, 7.4 mm.

Female. Front about as wide as ocellar triangle, polished black on upper half, silvery below. Third costal section but little over half the length of the fourth and the r-m crossvein is situated at about apical two thirds of third section (fig. 16b). Base of ovipositor subglobose with a distinct tubercle near apical portion, below; piercer slightly longer than base (fig. 16e).

Length: body, 5.7-6 mm.; wing, 6.4-6.7 mm.

Holotype ♂: Chiricahua Mts., Arizona, VII-4-40 (L. J. Lipovsky). Allotype and three paratype ♀♀ same data (D. E. Hardy and R. H. Beamer). All in the Snow Entomological Collection.

Excepting members of the NEPHROCERINAE this is the largest species known to the new world. The holotype male was taken hovering in the shade beneath an oak tree, all of the females were taken flying over a small mountain stream.

Cephalosphaera stricklandi (Curran)

(Plate 4, fig. 18a)

Pipunculus stricklandi Curran, 1927, Can. Ent. 59, 291.

This species is very near and possibly subspecific with *elegantula* (Williston); *stricklandi* apparently differs in having the femora chiefly black, only apices yellow and tarsi brown to black.

The following is the original description of the male:

"Black, the legs partly yellow; third antennal segment sharply rounded below; femora spinose beneath. Length 5.5 mm.

"*Male*. Face and front silvery gray, the eyes contiguous for half the distance above antennae; vertical triangle shining black; occiput gray pollinose, only very thinly so on upper half, the hair white. Antennae black; third segment brown, sparsely white pubescent, sharply rounded below, not at all produced.

"Mesonotum moderately yellowish-brown pollinose, the broad borders with thin grayish pollen; humeri, notopleurae and pleurae, thickly cinereous pollinose. The metanotum bears a very thin coating of pollen, the upper margin alone bearing dense grayish pollen. Mesonotum and scutellum with rather long cinereous pile; propleurae with long whitish hair.

"Coxae and femora black, the bases and broad apices of the latter reddish yellow; tibiae and basal tarsal segment reddish yellow the tarsi elsewhere brown or black. Femora gray pollinose and white pilose behind, the hair on the legs black; femora with short, spinose bristles on apical half of both edges of lower surface, the posterior femora with a row of short black bristles along the middle of the apical half in front, their tibiae with four bristles at the middle in front; all the tibiae bear an elongate brown spot at the middle on the posterior half. Posterior tibiae silvery and white haired behind.

"Wings with slight luteous tinge; stigma deep brown, entire; anterior cross-vein situated slightly beyond tip of auxiliary vein, and hardly one-third the distance from base of discal cell; fourth costal section (fifth section?) about one and a half as long as either of the two preceding sections. Squamae yellowish. Halteres brown, the stem partly reddish.

"Abdomen shining black above, the sides broadly densely gray pollinose, the pollen triangularly produced on each segment posteriorly, on the fifth extending more than one-third across, the fifth segment almost one and a half as long as the fourth. Genitalia slightly inclined to right, laterally compressed, projecting a distance equal to half the length of fifth segment, with a narrowly oval apical cleft, the appendages reddish yellow. Hair sub-appressed, cinereous."

Doctor W. J. Brown has kindly compared specimens with the type and made comparative notes on this species. The posterior tibiae are simple, not produced into apical spurs; the seventh sclerite is scarcely visible from dorsal view (fig. 18a).

Type locality: Waterton, Alta., Canada.

Type in Canadian National Museum.

Specimens have been identified from: Saskatoon, Sask., Canada,

June 3, 1926 (K. M. King); Ft. St. John, B. C., June 15, 1927; Lapeer Co., Michigan, Deerfield Twp. May 30, 1937 (G. Steyskal); Ft. Collins, Colorado; Colorado University Camp, Nederland, Colo., 10,000 ft., July 3-4, 1932; also one male specimen from Clouderoft, New Mexico, June 27, 1940 (D. E. Hardy) appears to belong here.

Female. Very much like *constricta* (Banks) differing from this only in having the front not so narrowed above; humeri brown to black instead of bright yellow; mesonotum covered with short erect pile; femora chiefly black, only apices and bases yellow, tarsi brownish. Ovipositor like *constricta* in shape, base black, piercer reddish brown.

Cephalosphaera tibialis n. sp.

(Plate 3, figs. 17a-f)

This species is related to *acuminata* and *appendiculata* but is very distinct from either of these. It is distinguished by the short third costal section, the deeply cleft eighth segment, the black, short acuminate third antennal segment and the dense white pilosity on the body.

Male. Head: Junction of eyes about equal to the length of frontal triangle; frontal triangle brownish to silvery pubescent with a longitudinal raised area down the middle and a row of short hairs down each side of this carina; bristles of second antennal segment very long on under side; third segment with a fine fringe of white pubescence on apical margin; mouthparts brownish yellow; occiput narrow, about one fifth as wide as the compound eyes. *Thorax:* Dorsum rather densely white haired and thickly covered with brown pollen; pleurae and metanotum faintly grayed; humeri black, halteres yellow; propleural fan composed of numerous long white hairs. *Legs:* Chiefly black, narrow bases of hind femora, extreme apices of all, broad bases and apices of tibiae and the first three to four tarsal subsegments yellow; last two tarsal subsegments brownish; femora moderately developed with strong flexor spines on under sides near apical portions, segments faintly grayed except for the shining black venters; posterior tibiae slightly arcuate, each with a well developed spur at apex on under side (fig. 17b); femora and tibiae with abundant long white hairs on the sides; tarsal claws long, slender, yellowish white except for the black tips; pulvillae about as long as the claws. *Wings:* Fourth costal section almost twice as long as third, stigma completely filling the short third section (fig. 17c); fifth section but little longer than the fourth, cross-vein r-m situated at about basal one fourth of the discal cell and at

end of subcostal vein; appendix of fourth vein situated about the length of the posterior crossvein from the crossvein; ultimate section of fourth vein sinuate. *Abdomen*: Basal portions of segments velvety black, apices subopaque, faintly grayed on the sides; sides somewhat rounding, abdomen broadest at segments three and four; the integument of the dorsum has a finely rugose appearance under high power. *Hypopygium*: About equal in length to the fifth abdominal segment; sixth segment plainly visible from dorsal view; the membranous portion of the eighth is large, extending almost to base of segment from dorsal and ventral views; eighth segment compressed to the right and somewhat pointed at apex (fig. 17e). From ventral view the ninth segment is as wide as long with a "U" shaped concavity in the middle of hind margin. The harpagones are broad at bases and gently taper into rounding apices with acute points on inner edges; inner margins slightly concave. Cerci rather elongate but very slender (fig. 17d).

Length: body, 4.2-4.6 mm.; wing, 4.8-5.2 mm.

Female. Compares in most respects to the males; the hind tibiae are simple, the third antennal segment is slightly longer acuminate and the third costal section is about one third the length of fourth. Front but little wider than ocellar triangle, chiefly opaque grayish with a subshining carina down the middle and the rows of hairs on the sides. Base of ovipositor rather elongate, with a distinct tubercle on underside near junction with piercer. Piercer almost equal to base in length, rather flattened dorsally and strongly curved upward at its apex (fig. 17f).

Holotype ♂; Ruidoso, New Mexico, June 26, 1940 (R. H. Beamer). Allotype ♀ and four paratype ♂♂ same data (D. E. Hardy). One ♀ paratype Fallon, Nevada, August 12, 1940 (E. E. Kenaga). All in Snow Entomological Collection.

Dorilas Meigan

Dorilas Meigen, 1800, *Nouv. Class. Mouch.* p. 31.

Pipunculus Latreille, 1802, *Hist. Nat. Crust. et. Ins.*, v. 3, p. 463.

Microcera Meigen, 1803, *Illiger's Mag.* II, 273.

Cephalops Fallen, 1810, *Specim. Dipt. Meth.* p. 10.

Alloneura Rondani, 1856, *Dipt. Ital. Prodr.* I, 14.

Dorylas Kertész, 1910, *Cat. Dipt.* VII, 368. This name was preoccupied by Dejean, 1835, *Cat. de. Coleo, de la Coll. de M. de le Compt Dejean*, Lief. 3, 409.

The genus as now defined includes all those *Dorilaidae* having a distinct stigma in the wing; normal venation; no vertical or ocellar bristles on the head or mesonotal or scutellar bristles on the thorax. The third segment of the antennae is usually sharply pointed below,

only in rare cases is it rounding or obtuse. The genus is divided into two subgenera by the presence or absence of a row of strong hairs on the propleurae; those species having the propleurae bare (*Eudorylas* Aczel) are being placed in the subgenus *Dorilas* (*Eudorylas*) Aczel. The following species belong in the typical *Dorilas* (*Dorilas*): *alpinus* (Cresson), *angus* (Cresson), *ater* (Meigen), *banksi* (Aczel), *fuscus* (Loew), *houghii* (Kertész), *luteicornis* (Cresson), *pallipes* (Johnson), *trichaetus* (Malloch) and *varius* (Cresson).

Genotype: *Dorilas campestris* (Latreille) (*Pipunculus*).

Dorilas (*Eudorylas*) Aczel

Eudorylas Aczel, 1940, Zoöl. Anz. 1.12, Bd. 132, Heft 7/8, 151.

Aczel described *Eudorylas* as a new genus, but the writer prefers to consider this just a subgenus. The species are separated from *Dorilas* by the absence of the propleural fan of hairs. Because of the difficulty in checking this character and the apparent lack of consistent accompanying characters the writer does not consider this a generic character.

This subgenus contains the following species of *Dorilas*: *abberatus* (Hardy-Knowlton), *aequus* (Cresson), *affinis* (Cresson), *alternatus* (Cresson), *apicalis* (Hardy-Knowlton), *aquavicinus* n. sp., *atlanticus* (Hough), *bidactylus* n. sp., *caudatus* (Cresson), *cinctus* (Banks), *curtus* n. sp., *fuscitarsis* (Adams), *grandis* n. sp., *harmstoni* (Hardy-Knowlton), *huachucanus* n. sp., *kansensis* Hardy, *lasiofemoratus* (Hardy-Knowlton), *latipennis* (Banks), *lautus* n. sp., *loewii* (Kertész), *minor* (Cresson), *montivagus* n. sp., *nevadaensis* n. sp., *nigripes* (Loew), *reipublicae* (Walker), *sabroskyi* n. sp., *stainsi* n. sp., *stigmaticus* (Malloch), *subopacus* (Loew), *tarsalis* (Banks) and *vierecki* (Malloch).

Genotype: *Eudorylas opacus* (Fallen).

Dorilas flavitarsis (Williston) and *D. willistoni* (Kertész) are of doubtful position.

KEY TO SPECIES OF *Dorilas*

1. Humeri brown or black in ground color..... 2
 Humeri yellow or white in ground color..... 33
2. (1) Ninth segment of male very large and conspicuous, as large as eighth and plainly visible from side view; inner harpagone long, slender and curved, outer harpagone small (figs. 28b, 30d); eyes of male narrowly separated on front. Female ovipositor with large tuberculate base; third antennal segment acute, except in *grandis* females which have the front narrow.... 3
- Ninth segment normal, harpagones more nearly equal in size and shape; eyes of male usually contiguous on front; if base of ovipositor is tuberculate the third antennal segment is long acuminate and yellow; halteres usually yellow 8

3. (2) Femora largely black; eyes of female narrowly separated on front; front scarcely wider on upper third than width of median ocellus..... 4
 Only coxae black, legs otherwise yellow; front of female wider than width of median ocellus; male hypopygium with indented area on right side and small membranous apex; ninth segment plainly visible from dorsal view; seventh sclerite large..... 5
4. (3) Hypopygium of male evenly rounded, no indentation or membranous area, ninth segment not visible from dorsal view, seventh sclerite small; third antennal segment acute; ovipositor base large, rounding, strongly tuberculate below (fig. 45d), quadrate at apex.....*huachucanus* n. sp. p. 95
 Third antennal segment acuminate; ovipositor base more elongate, not square tipped or so strongly tuberculate below (fig. 41f). (Females of this species run here)*grandis*, n. sp., p. 90
5. (3) Females 6
 Males 7
6. (5) Front broad, wider than the width of ocellar triangle; base of ovipositor swollen but not greatly tuberculate (fig. 30c).....*atlanticus* (Hough), p. 77
 Front rather narrow, not as wide as ocellar triangle; base of ovipositor strongly tuberculate below (fig. 28d).....*aquavicus* n. sp. p. 72
7. (5) Inner harpagone greatly enlarged and rounding apically (fig. 28b) with an acute process on outer edge below (fig. 28c); base of inner harpagone produced into a square topped development on inner side; outer harpagone simple; sixth sclerite with a pair of sharply pointed processes on posterior margin (fig. 28e).....*aquavicus* n. sp. p. 72
 Inner harpagone not so shaped (fig. 30d), without process on outside edge; base developed into a pair of lobes; outer harpagone more irregular, with a rounding development on outer edge; processes of sixth sclerite blunt, rather widely spaced (fig. 30e).....*atlanticus* (Hough), p. 77
8. (2) Eyes of both sexes narrowly separated on front; sixth and seventh sclerites of male well developed, occupying most of left side of hypopygium....
*grandis* n. sp. p. 90
 Eyes of male contiguous for at least part of length of front; of female widely separated; sixth and seventh sclerites normal..... 9
9. (8) Legs entirely yellow; third antennal segment long, acuminate and yellow; larger species (body 3.5-4 mm)..... 10
 Femora at least discolored with black; antennae usually black; smaller species 11
10. (9) Third costal section short, about one fourth the length of fourth section; stigma occupying only apical corner of third section.....*curtus* n. sp., p. 85
 Third section almost equal to fourth; stigma occupying most of third section*vierecki* (Malloch), p. 125
11. (9) Males 12
 Females 59
12. (11) Hypopygium cleft, at least apically, or with a distinct depressed area; usually compressed to the right, sometimes with an apical keel..... 13
 Hypopygium without a cleft or depression, usually not compressed to the side and more symmetrical 30
13. (12) Hypopygium asymmetrical, well developed and usually as large or larger than fifth segment from lateral view; often with an apical keel..... 14
 Hypopygium usually symmetrical and small, depression or cleft usually more indistinct, if with a distinct apical cleft the hypopygium is very much shorter than the fifth segment, scarcely visible from above..... 24
14. (13) Abdomen opaque or subopaque to cinereous, not shining or polished..... 15
 Abdomen shining or polished, at least on posterior halves of segments, never more than bases opaque..... 17

15. (14) Abdomen subopaque to subshining, usually cinereous, velvety black only at bases of segments..... 19
 Abdomen entirely opaque velvety brown or black, without traces of gray.... 16
16. (15) Third antennal segment short, rounding below; very small species, 2 mm. in length *banksi* (Aczel), p. 78
 Third antennal segment acute; larger species, 4-5 mm. in length.....
 *ater* var. *velutinus* (Cresson), p. 76
17. (14) Hypopygium with apical membranous area; no apical keel; tibiae yellow; femora with not more than broad bands of black; species almost bare; smaller species, (3.2 mm. in length).....17a. *varius* (Cresson) p. 122
 Membranous area of hypopygium extends nearly to base of eighth segment or if apical a strong keel is present; femora and tibiae chiefly black; rather thickly haired species; larger species (4-5 mm.)..... 18
 17a. Third antennal segment black..... 17b
 Third antennal segment yellow..... *varius varius* (Cresson), p. 122
 17b. Hypopygium with large apical depressed area.....
 *varius* var. *mainensis* (Cresson), p. 124
 Membranous area very small, situated slightly to the left and scarcely visible from dorsal view.....
 *varius* var. *phaethus* (Hardy-Knowlton), p. 124
18. (17) Cleft of hypopygium dorsal, depression extending toward base of segment, keel arising beneath the cleft (fig. 29d)..... *ater* (Meigne), p. 74
 Hypopygium with apical cleft or depression, keel usually arising from the middle of the depression (fig. 39d)..... *fuscus fuscus* (Loew), p. 88
19. (15) Antennae black 20
 Antennae yellow ? *flavitarsis* (Williston), p. 86
20. (19) Abdomen distinctly fasciated with white or gray; bases of segments opaque, 21
 Abdomen not distinctly fasciated, sometimes nearly shining..... 22
21. (20) Third antennal segment acute; ultimate section of fourth vein strongly sinuate; larger species, 4-5 mm..... *loewii* (Kertész), p. 101
 Third antennal segment acuminate; ultimate section of fourth vein nearly straight; smaller species, 2.5-3.3 mm. in length.....21a. *cinctus* (Banks), p. 83
 21a. Third section of costa about twice as long as fourth.....
 *cinctus cinctus* (Banks), p. 83
 Third section about equal to the fourth.....
 *cinctus subtilis* n. sub. sp., p. 84
22. (20) Ultimate section of fourth vein straight..... 23
 Ultimate section of fourth vein strongly sinuate (atypical specimens may run here) *loewii* (Kertész), p. 101
23. (22) Third antennal segment acuminate; hypopygium quadrate in outline, larger than fifth segment; moderately sized species, body 3.5-4 mm.....
 *caudatus caudatus* (Cresson), p. 81
 Third antennal segment short, rounded below; hypopygium shorter than fifth segment; small species, 2 mm. in length..... *banksi* (Aczel), p. 78
24. (13) Knobs of halteres black or brown..... 25
 Knobs of halteres yellow or white. 24a..... *varius* (Cresson), p. 122
 24a. Third antennal segment black..... 24b
 Third antennal segment yellow..... *varius varius* (Cresson), p. 122
 24a. Hypopygium with large apical cleft, plainly visible from above....
 *varius* var. *mainensis* (Cresson), p. 124
 Hypopygium with only a small membranous apex.....
 *varius* var. *phaethus* (Hardy-Knowlton), p. 124
25. (24) Abdomen polished, at most only bases opaque or cinereous..... 26
 Abdomen fasciated faintly or distinctly with gray or white, or entirely opaque on first four and anterior half of fifth segments..... 27

26. (25) Third antennal segment long acuminate; hypopygium with basal depression on right side (fig. 61b); femora chiefly black; stigma of wing short, only filling apical portion of third costal section.....*stigmaticus brachystigmaticus* (Hardy-Knowlton), p. 115
 Third antennal segment acute; hypopygium with apical cleft; femora broadly yellow at bases and apices; stigma filling third costal section.....*varius* (Cresson), p. 122
27. (25) Abdomen entirely opaque or but faintly fasciated, first segment only distinctly grayed; stigma short not over one half the length of the fourth costal section.....*lasiofemoratus* (Hardy-Knowlton), p. 98
 Abdomen distinctly fasciated; apices of segments gray to white; stigma about equal to fourth section..... 28
28. (27) Third antennal segment black..... 29
 Third antennal segment yellow (México).....? *flavitaris* (Williston), p. 86
29. (28) Third segments of antennae acuminate; small species, 2.5-3.2 mm. in length.....*cinctus* (Banks), p. 83
 Third segments broadly acute; large species, body 3.8-4.2 mm.; wings 5.3-5.6 mm.....*alternatus* (Cresson), p. 69
30. (12) Antennae black 31
 Antennae yellow. (México).....? *flavitaris* (Williston), p. 86
31. (30) Stigma as long or longer than fourth costal section.....*nigripes* (Loew), p. 107
 Stigma much shorter than fourth costal section..... 32
32. (31) Wings narrow; subcostal cell narrowed so stigma is not very distinct; apical cell strongly attenuated before wing margin (fig. 54c); ninth segment greatly developed, somewhat swollen from side view (fig. 54e), ninth about as large as eighth; cleft on hind margin narrowly 'U' shaped; harpagones acutely pointed; cerci small, scarcely extending past apices of ninth segment*nevadaensis* n. sp., p. 106
 Wings broad, more rounding; subcostal as well as apical cell broad at wing margin (fig. 60c); ninth segment normal, scarcely visible from side view (fig. 61g), much smaller than eighth; cleft broadly 'U' shaped; harpagones short and blunt; cerci elongate, extending to about apices of harpagones. 32a.....*stigmaticus* (Malloch), p. 114
 32a. Third section of costa more than one half the length of fourth; stigma very dark and filling about three fourths of third section; r-m crossvein situated near basal one third of discal cell.....*stigmaticus stigmaticus* (Malloch), p. 114
 Third costal section about one third of fourth; stigma only occupying apex of third section; r-m at basal one fifth of discal cell.....*stigmaticus brachystigmaticus* (Hardy-Knowlton), p. 115
33. (1) Males 34
 Females 70
34. (33) Legs yellow, or at most with only femora slightly discolored with brownish medianly, never distinctly black ringed..... 35
 At least femora of legs chiefly dark brown to black, never more than their extremities yellow..... 39
35. (34) Abdomen opaque or subopaque; apices of segments with or without gray fasciae 36
 Abdomen chiefly shining or polished..... 38
36. (35) Third antennal segment long, acuminate, yellow..... 37
 Third antennal segment acute, brown to black; large species, 4.5-5.3 mm. in length*atlanticus* (Hough), p. 77
37. (36) Small species, 3-3.5 mm. in length; hypopygium but little developed, without apical keel37a. *minor* (Cresson), p. 103
 Species 4.5-5 mm.; hypopygium larger than fifth segment and with a small apical keel (atypical specimens may run here).....*aequus* (Cresson), p. 64

37a.	Abdomen chiefly black.....	<i>minor minor</i> (Cresson), p. 103
	Hypopygium, sides of abdomen and venter yellow.....	<i>minor cressoni</i> (Johnson), p. 104
38. (35)	All femora slender, not discolored with brown; first segment and lateral margins of abdomen cinereous, otherwise polished....	<i>pallipes</i> (Johnson), p. 109
	Posterior femora greatly thickened and somewhat discolored with brown medianly; bases of abdominal segments usually opaque black.....	
38a. <i>houghii</i> (Kerteszi), p. 92	
	38a. Third antennal segment yellow; third section of costa shorter than the fourth.....	<i>houghii houghii</i> (Kerteszi), p. 92
	Antennae brown to black; third costal section longer than the fourth.....	<i>houghii apicarinus</i> (Hardy-Knowlton), p. 94
39. (34)	Hypopygium usually asymmetrical, with a distinct depressed area or with an apical keel	40
	Hypopygium more symmetrical, without a distinct apical depression or cleft	54
40. (39)	Abdomen opaque or subopaque, usually variegated with grey.....	41
	Abdomen polished at least on apical three fourths of segments.....	51
41. (40)	Hypopygium with a prominent apical keel usually visible; abdomen opaque brown and grey fasciated.....	42
	Hypopygium without keel; abdomen subopaque, evenly brownish tinged, only faintly marked with gray except in <i>reipublicae</i> which has the fourth segment entirely cinereous and <i>apicalis</i> which is distinctly fasciated with gray	43
42. (41)	Third antennal segment yellowish; posterior femora rather slender, with weak flexor spines; third costal section and stigma much longer than the fourth section	<i>aequus</i> (Cresson), p. 64
	Antennae brownish black; post-femora greatly thickened, with strong flexor spines; third costal section much shorter than fourth.....	
 <i>houghii</i> var. <i>curvittibiae</i> (Hardy), p. 94	
43. (43)	Stigma equaling or distinctly longer than the fourth costal section; third section longer than fourth.....	44
	Stigma but a fraction of the fourth section in length; third costal section less than one half the length of fourth; fourth abdominal segment cinereous	<i>reipublicae</i> (Walker), p. 110
44. (43)	Hypopygium with a distinct apical depressed area or cleft.....	45
	Hypopygium with a distinct lateral cleft (fig. 38c) no depression apically	<i>fuscitarsus</i> (Adams), p. 87
45. (44)	Third costal section almost twice as long as the fourth (except in <i>cinctus subtilis</i> which is distinguished by its small (hypopygium); hypopygium rather small, seldom over half the length of the fifth segment, more rounded in outline	50
	Third costal section about equal to the fourth in length; hypopygium large, equal or longer than the fifth segment, usually quadrate in outline.....	46
46. (45)	Hypopygium rounding on the right side with the depressed area to the left; harpagones short and broad, densely haired and not produced at apices (fig. 59b).....	<i>stainsi</i> n. sp., p. 113
	Hypopygium usually more quadrate with an apical depressed area; harpagones not so shaped.....	47
47. (46)	Hypopygium rather symmetrical with only a small membranous area at apex; outer harpagone developed into a long slender apical lobe; inner harpagone broad not produced (atypical specimens run here).....	
 <i>affinis</i> (Cresson), p. 67	
	Hypopygium more quadrate; harpagones differently shaped.....	48

48. (47) Harpagones rather symmetrical, tapering into slender apices which curve sharply downward (fig. 33c); hypopygium with a very large depressed area at apex.....*caudatus* var. *discolor* (Banks), p. 82
Harpagones very asymmetrical..... 49
49. (48) Outer harpagone developed into two lobes apically; inner harpagone more elongate, terminating in an obtuse apex (fig. 32c); apical depression smaller.....*bidactylus* n. sp., p. 80
Outer harpagone simple; inner produced into two lobes apically (fig. 21b)*aequus* var. *argyrofrons* (Hardy-Knowlton), p. 66
50. (45) Third antennal segment acuminate; abdomen only faintly fasciated, broadly rounding; harpagones symmetrical, strongly curved on outside margins, apices divergent50a. *cinctus* (Banks), p. 83
Third antennal segment short acute; abdomen distinctly gray fasciated, sides nearly straight.....*apicalis* (Hardy-Knowlton), p. 71
50a. Third section of costa about twice the length of fourth.....*cinctus cinctus* (Banks), p. 83
Third section about equal to fourth..*cinctus subtilis* n. sub. sp., p. 84
51. (40) Antennae black, acute to obtuse; wings with a brownish tinge..... 53
Third antennal segment yellow, long acuminate; wings hyaline, with only apical portion of stigma colored..... 52
52. (51) Eyes narrowly separated on the front; hypopygium one half the length of fifth segment; halteres yellow.....*montivagus* n. sp., p. 104
Eyes contiguous for the length of front; hypopygium about equal to fifth; halteres brown to black.....*tarsalis* (Banks), p. 120
53. (50) Halteres yellow; hypopygium well developed, with an apical cleft and vertical keel at apex.....*fuscus* var. *nitidiventris* (Loew), p. 89
Halteres black; hypopygium not greatly developed, with a basal cleft area on the right side, no keel present.....*harmstoni* (Hardy-Knowlton), p. 92
54. (39) Abdomen subopaque with a grayish to brownish tinge on the dorsum..... 55
Abdomen polished, only faintly grayed at base and on sides; stigma filling only apical one half of third costal section.....*tarsalis* (Banks), p. 120
55. (54) Hypopygium rather small, about equal or much shorter than length of fifth segment, not so broad as width of fifth; sides of abdomen tapering posteriorly from about third segment..... 57
Hypopygium very large and broad, as wide as and much longer than the fifth segment; sides of abdomen straight..... 56
56. (55) Hypopygium two times as long as fifth; ninth segment equal in size to the eighth, tuberculate and irregular on outside margin; harpagones strongly curved downward and slightly enlarged apically.....*lautus* n. sp., p. 99
Hypopygium not over one and one half times longer than fifth; ninth segment about half the size of eighth; harpagones straight.....
.....56a. *subopacus* (Loew), p. 117
56a. Bases and apices of femora broadly yellow; tibiae yellow; third section of costa longer than fourth.....
.....*subopacus subopacus* (Loew), p. 117
Femora chiefly black, only narrow apices yellow; tibiae blackened medianly; third costal section shorter than fourth.....
.....*subopacus industrius* (Knab), p. 119
57. (55) Third section of costa about twice the length of fourth; harpagones enlarged and rounding at their apices; cleft of ninth segment 'V' shaped, no membranous area at apex.....*sabroskyi* n. sp., p. 112
Third section about equal to fourth; harpagones not as above; cleft of ninth 'U' shaped and a distinct membranous area at apex of eighth..... 58
58. (57) Thorax and abdomen subshining in ground color; abdominal segments without distinct vittae; hypopygium about equal to fifth segment in length; ninth segment black; harpagones rather symmetrical and obtuse (fig. 46b)*kansensis* Hardy, p. 97

- Thorax and abdomen opaque brownish to gray; abdominal segments with gray vittae at apices; hypopygium shorter than fifth; ninth segment yellow; outer harpagone produced into a fingerlike projection at apex (fig. 23f).....*affinis* (Cresson), p. 67
59. (11) At least femora chiefly black, usually never more than apices yellow; median portions usually black..... 60
 Legs chiefly yellow, except discolored femoral rings.....
*varius* var. *mainensis* (Cresson), p. 124
60. (59) Piercer of ovipositor decidedly longer than its base..... 61
 Piercer not longer than base..... 65
61. (60) Third antennal segment long acuminate below..... 62
 Third segment acute to obtuse..... 64
62. (61) Third costal section over one half the length of fourth; stigma filling three fourths of third section; r-m crossvein situated much beyond end of subcostal vein and beyond basal one third of discal cell, slightly behind the middle; wings more hyaline; base of ovipositor elongate; piercer slender, reaching to base of abdomen.....*abberatus* (Hardy-Knowlton), p. 63
 Third costal section less than half the length of fourth; base of ovipositor usually short and globose; piercer reaching only to the posterior margin of third abdominal segment, if the piercer is more elongate the base is short and rather thick..... 63
63. (62) Ovipositor base rather elongate, piercer short, thick, slightly curved (fig. 54b) but little longer than base; wings slender, subcostal cell narrow; apical cell strongly attenuated before wing margin.....*nevadaensis* n. sp., p. 106
 Ovipositor base globose; piercer long, slender, twice as long as base; wings rather broad; subcostal cell wider and apical cell widely open in wing margin63a. *stigmaticus* (Malloch), p. 114
 63a. Third antennal segment very long acuminate (fig. 61a); stigma very short, occupying only apical corner of third costal section; fifth costal section shorter than third and fourth combined; crossvein r-m situated nearer base of discal cell.....
*stigmaticus brachystigmaticus* (Hardy-Knowlton), p. 115
 Third antennal segment not so elongate (fig. 60a); stigma filling three fourths of third costal section; fifth costal section about equal to third and fourth combined, *stigmaticus stigmaticus* (Malloch), p. 114
64. (61) Piercer not more than twice as long as its elongate base, gradually tapering; front shining black above; stigma equaling or longer than fourth costal section*loewii* (Kertész), p. 101
 Piercer more slender, over three times as long as and abruptly terminating its large globose base; front silvery; stigma not over one half as long as fourth costal section.....*alternatus* (Cresson), p. 69
65. (60) Third costal section very short, less than one third length of fourth; stigma scarcely visible (fig. 54c).....*nevadaensis* n. sp., p. 106
 Third costal section never much shorter than fourth section; stigma distinct, 66
66. (65) Middle femora with white hairs posteriorly; tibiae and tarsi with distinct strong hairs; hind tibiae with three very distinct long serial, bristlelike hairs on antero-dorsal surface at middle; legs chiefly black; antennae long acuminate; ovipositor reaching to apex of second abdominal segment; abdomen subopaque.....*trichaetus* (Malloch), p. 121
 Not with the above combination of characters..... 67
67. (66) Abdomen almost entirely polished, cinereous only laterally; larger species, 4-5 mm. in length (association with males needed for separation).....
*ater* (Meigen) and *fuscus* (Loew), p.
 Abdomen broad, opaque or subopaque with gray fasciae; small species, 2-3.3 mm. in length..... 68

68. (67) Front opaque; third antennal segment acute; halteres black.....
 *cinctus subtilis* n. subsp., p. 84
 Front shining black except just above antennae; third antennal segment
 acuminate or obtuse and rounding..... 69
69. (68) Piercer of ovipositor slender, reaching almost to base of abdomen (yet not
 longer than its base); third segment of antenna acuminate.....
 *nigripes* (Loew), p. 107
 Piercer of ovipositor very broad; thick and tapering third antennal segment
 obtuse and rounding below.....*banksi* (Aczel), p. 78
70. (33) Abdomen opaque or subopaque, cinereous to slightly shining but never
 polished..... 71
 Abdomen polished, at most only first segment and lateral margins of ab-
 domen cinereous..... 82
71. (70) Legs yellow, at most only femora discolored with brown medianly; third
 antennal segment often bright yellow..... 72
 Femora chiefly black, at most only extremities yellow; third antennal seg-
 ment brown or black..... 74
72. (71) Larger species (4.5-5.5 mm.); last section of fourth vein slightly curved to
 strongly sinuate..... 73
 Small species (3.0 mm.); last section of fourth vein straight.....
 *minor* (Cresson), p. 103
73. (72) Third antennal segment short acute.....*atlanticus* (Hough), p. 77
 Third antennal segment long acuminate.....73a. *aequus* (Cresson), p. 64
 73a. Third antennal segment bright yellow..... 73b
 Third antennal segment black....*aequus* var. *argyrofrons* (Hardy-Knowlton), p. 66
 73b. Front silvery to the vertex.....
 *aequus* var. *longipes* (Hardy-Knowlton), p. 66
 Front shining black on upper one third to one half.....
 *aequus aequus* (Cresson), p. 64
74. (71) Piercer distinctly longer than base, at least twice as long from base of vaginal
 orifice..... 75
 Piercer not longer than its base; ovipositor not so developed..... 76
75. (74) Third antennal segment very long acuminate below; ovipositor reaching only
 to about second abdominal segment.....*cinctus subtilis* n. sub. sp., p. 84
 Third antennal segment acute; ovipositor extending to base of abdomen....
 *alternatus* (Cresson), p. 69
76. (74) Stigma completely filling the third costal section..... 77
 Stigma very short, occupying only apical portion of third section; ovi-
 positor with a tubercle beneath.....*reipublicae* (Walker), p. 110
77. (76) Ovipositor prominent, extending much beyond fifth segment; sixth tergum
 normal not forming a receptacle on the venter for the ovipositor... 78, p.
 Ovipositor very small, piercer not extending past base of fifth segment; mar-
 gins of sixth tergum coming together on the venter to form a groove into
 which the ovipositor fits in resting position, sometimes the ovipositor is
 completely hidden..... 81
78. (77) Base of ovipositor very large, about equal to sixth segment in size from lateral
 view (fig. 49b); rather strongly compressed dorso-ventrally (fig. 49c)....
 *lautus* n. sp., p. 99
 Ovipositor base not so developed, subglobose in shape..... 79
79. (78) Ultimate section of fourth vein straight..... 80
 Ultimate section of fourth vein strongly sinuate.....*kansensis* Hardy, p. 97
80. (78) Third costal section about equal to fourth; extremities of femora yellow; only
 upper portion of front shining black; ovipositor base polished black,
 evenly rounding above (fig. 23c).....*affinis* (Cresson), p. 67

- Third section one and one half times the length of fourth; only extreme apices of femora yellow; front chiefly shining black, silvery just above antennae; ovipositor base opaque yellowish, rather oval above and slightly tuberculate below (fig. 58c).....*sabroskyi* n. sp., p. 112
81. (77) Ultimate section of fourth vein sinuate; ovipositor very inconspicuous, often not visible; hypopygium of male large and symmetrical.....
.....81a. *subopacus* (Loew), p. 117
Ultimate section of fourth vein straight; ovipositor more conspicuous, not hidden; hypopygium of male with a large apical depression.....
.....*caudatus* var. *discolor* (Banks), p. 82
81a. Femora yellow basally and apically; tibiae entirely yellow....
.....*subopacus subopacus* (Loew), p. 117
Femora only yellowed at apices; tibiae blackened medianly..
.....*subopacus industrius* (Knab), p. 119
82. (70) Legs entirely yellow..... 83
At least femora with broad brown to black rings..... 85
83. (82) Wings extremely broad and rounding apically; third section of costa short, not over one half the length of the fourth.....*latipennis* (Banks), p. 99
Wings normal; third section of costa at least as long as the fourth..... 84
84. (83) Femora slender; piercer of ovipositor very short, with a globose base.....
.....*pallipes* (Johnson), p. 109
Femora much thickened; base of ovipositor elongate, tip of piercer reaching third abdominal segment.....*houghii* (Kertész), p. 92
85. (82) Third antennal segment brown to black..... 86
Third antennal segment bright yellow..... 88
86. (85) Piercer of ovipositor rather short, but little if any longer than its base..... 87
Piercer slender and curved upward (fig. 24b), longer than and abruptly terminating its elongate base; base with a small tubercle below; tip of piercer extending to base of abdomen.....*alpinus* (Cresson), p. 68
87. (86) Base of ovipositor globose, piercer abruptly terminating its base; front chiefly shining*angus* (Cresson), p. 71
Base of ovipositor more elongate, front silvery.....
.....*fuscus* var. *nitidiventris* (Loew), p. 89
88. (85) Costal section not over one half the length of fourth..... 89
Wings normal; third section of costa about equal to fourth.....
.....*luteicornis* (Cresson), p. 102
89. (88) Wings extremely broad and rounding apically, stigma completely fills third costal section; fifth costal section shorter than fourth; base of ovipositor simple (some may run here by having the femora discolored)
.....*lateipennis* (Banks), p. 99
Wings normal in shape; stigma occupying only the apex of third costal section; fifth section more than one and one half times the length of third and fourth combined; base of ovipositor with a tubercle below.....
.....*montivagus* n. sp., p. 104

Dorilas (Eudorylas) abberatus (Hardy-Knowlton)

(Plate 4, figs. 19a-c)

Pipunculus abberatus Hardy and Knowlton, 1939, Can. Ent. LXXI, 87.

The following is the original description:

"*Female*. Face and lower one-third of front silvery, upper two-thirds of front, vertex and upper occiput shining black; occiput cinereous below. Mouth-parts chiefly brownish black, tip of labellum yellowish. Antennae black, third segment with a narrow acuminate point below (fig. 19a).

"Humeri and knobs of halteres black with cinereous pollen. Mesonotum and scutellum sub-opaque faintly shining, brownish black, lightly dusted with gray on the margins. Pleurae, metanotum, coxae and most of femora and tibiae cinereous. Trochanters with a faint yellowish tinge. Femora yellow apically; bases of tibiae yellow, their apices very narrowly so. Tarsi brownish yellow, apical one-half of claws black. Femoral and tibial spines developed but not strong. Middle coxae with two to three black hairs above near their apices, posterior trochanters with a short clump of hairs near the bases.

"First abdominal segment silvery gray, other segments brownish gray pruinose posteriorly and on the sides, opaque brownish black anteriorly. Comb of first abdominal segment black, the bristles placed in a row across the segment. Base of ovipositor somewhat globular, dark brown with gray pollen; piercer reddish brown, long and slender, reaching to the base of the abdomen (fig. 19c).

"Wings hyaline, third costal section much shorter than fourth, stigma about one-half the length of third section (fig. 19b). Ultimate section of fourth vein slightly sinuate, last section of fifth about equal to posterior crossvein; r-m crossvein beyond end of auxiliary vein and slightly behind middle of discal cell. Petiole of anal cell rather short."

Length: body, 3.4-3.6 mm.; wing, 4-4.5 mm.

Male unknown.

Type locality: Bluffdale, Utah.

Type at Utah State Agriculture College.

Added distribution: Strawberry, Utah, Aug. 4, 1938 (G. F. Knowlton, G. S. Stains); Grouse Creek, Utah, Aug. 30, 1939 (G. F. Knowlton, F. C. Harmston); and Fallon, Nevada, Aug. 12, 1940 (D. E. Hardy). Specimens from Suwanee Springs, Florida, compare in most respects with Utah material, although the third antennal segment is more acuminate and the piercer of ovipositor slightly longer.

Dorilas (Eulorylas) aequus (Cresson)

(Plate 4, figs. 20a-e)

Pipunculus aequus Cresson, 1911, Trans. Am. Ent. Soc. XXXVI, 293.

This species is related to *atlanticus* (Hough) and *houghii* (Kertész) but is easily separated by antennal and genital characters.

Male. Head: Occiput broad, entirely cinereous; ocellar triangle shining, front and face silvery; compound eyes joined for about half the distance of the front; first two antennal segments black, second segment only weakly haired; third segment yellow, long acuminate, densely white pubescent (fig. 20a); mouth parts yellowish. *Thorax:* Mesonotum opaque, faintly shining in ground color, brownish pollinose above, gray on the margins; scutellum subshining, lightly gray dusted. Pleurae and metanotum cinereous; humeri and halteres yellow, knobs sometimes with brownish tinge, propleurae bare; legs chiefly yellow, femora with broad brownish to black bands, apices

and bases bright yellow; apical joints of tarsi brown. Femora only slightly enlarged, femoral spines weak; apical bristles of front and middle tibiae rather strong; posterior tibiae slightly arcuate. *Wings*: Faintly brownish tinged, stigma filling third costal section, third section slightly longer than the fourth, fifth costal section shorter than third and fourth together; crossvein r-m situated at, or just beyond the end of the subcostal vein, at about basal one third of discal cell; ultimate section of fourth vein (M_{1+2}) slightly curved; last section of fifth about equal to the posterior crossvein. *Abdomen*: Opaque, entire first segment and lateral margins of other segments cinereous, apical edges of segments gray, otherwise brown pollinose; fifth abdominal segment about one fourth longer than fourth segment. Hypopygium rather large, almost equal to the fifth segment as viewed from above; slightly compressed to the right, with a large apical depression extending ventrally, and a small apical projection or keel situated in the upper median portion of the depression (fig. 20b), ninth segment yellow. Almost bare species, with but few scattered hairs on thorax and abdomen.

Length: body, 5.0 mm.; wings, 5.5 mm.

Female. Lower portion of front silvery, upper portion subshining black. Apices of abdominal segments more cinereous, the fasciae broader. Legs chiefly yellow, coxae black, median portion of femora discolored brown to black. Ovipositor short, reaching just past apical margin of fourth segment; piercer yellowish to red, shorter than its base in length. Base of ovipositor blackish, large, with a yellowish gibbosity beneath. This gibbose portion folds up into a sternal cavity when in normal position; piercer broadly attached to its base (fig. 20d); otherwise like the male.

There are apparent variations in the color of the antennae and the humeri in this species. Some specimens examined have had the humeri brown to black, others have had the third antennal segment dark. These may prove to be distinct subspecies or varieties.

Type locality: Hyannisport, Mass.

Type in Boston Society of Natural History Museum.

The writer has examined the type series; also specimens from the following states: Illinois, Kansas, Maine, Maryland, Massachusetts, Michigan, New Hampshire, New Jersey, New York, North Carolina, Rhode Island, Texas, Utah, Vermont, and Virginia, also Ontario and Quebec, Canada.

Dorilas aequus var. *argryofrons* (Hardy-Knowlton)

(Plate 4, figs. 21a-c)

Pipunculus aequus var. *argryofrons* Hardy-Knowlton, 1939, Can. Ento. LXXI

This variety differs from typical *aequus* in having the antennae entirely brown to black and the front entirely silvery. The femora are chiefly black with narrow apices and bases yellow; the ovipositor base is subglobose, piercer but little longer than the base, gently tapering (fig. 21c) and extending to the anterior margin of second abdominal segment.

A male specimen is at hand which may possibly belong with the above female although no direct association has been made; if this belongs here *argryofrons* should be considered a distinct species. The male runs near *caudatus* var. *discolor* but the hypopygium is not so quadrate in outline, the large apical cleft is situated slightly to the right side and the inner harpagone is developed into two lobes at apex (fig. 21b).

Type locality: Logan Canyon, Utah.

Type at Utah State Agricultural College.

The male discussed above is from Butlerville, Utah, Aug. 26, 1938 (G. F. Knowlton).

Dorilas aequus var. *longipes* (Hardy-Knowlton)

(Plate 4, fig. 22a)

Pipunculus aequus var. *longipes* Hardy-Knowlton, 1939, Can. Ent. LXXI, 88

Differing from the typical *aequus* in having the front of the female entirely silvery.

The following is the original description:

"*Female*. Face, front and occiput entirely silvery except for shining black spot on vertex. Mouthparts, third segment of antennae, humeri and halteres bright yellow. Second segment of antennae and broad-based arista shining black; second segment with a long yellow bristle ventrally and numerous short black bristles dorsally.

"Mesonotum and scutellum with brownish gray reclinate pubescence, ground color black; sides of abdomen sparsely covered with short yellow hairs. Trochanters and rest of legs chiefly yellow, femora and tibiae with a blackish tinge dorso-medially, femora not distinctly black ringed. Femoral spines weak, posterior tibiae slightly bowed.

"Abdomen gray pruinose on sides and anterior half of each segment. Brush of first segment composed of long pale yellow-brown hairs. Base of ovipositor dark brown elongate, as long as strongly tapering yellow ovipositor. Ovipositor reaches to about the anterior edge of the fourth abdominal segment (fig. 22a).

"Wings hyaline, third costal section and stigma longer than fourth section. Ultimate section of fourth vein straight. Last section of the fifth vein slightly longer than posterior crossvein; anal cell with but a short petiole."

Male unknown.

Type locality: Logan Canyon, Utah.

Type at Utah State Agricultural College.

Specimens at hand from the following localities appear to belong here: Raleigh, N. C., April 20, 1925 (C. S. Brimley); Pottawatomie, Kansas, April 28, 1930 (R. H. Painter) and Cold Spring Harbor, L. I., June 15, 1931 (C. H. Curran).

Dorilas (Eudorylas) affinis (Cresson)

(Plate 4, figs. 23a-f)

Pipunculus affinis Cresson, 1911, Trans. Amer. Ent. Soc. XXXVI, 283.

Pipunculus globosus Cresson, 1912, Ent. News, XXIII, 453. New synonym.

The name *globosus* was applied to a female specimen which Cresson allied to *aequus* Cresson. Examination of the types showed that this was incorrectly placed; the holotype is identical with females of *affinis*.

This species is closely related to *subopacus* (Loew) but is easily separated by the reproductive structures of both sexes, the specimens of *affinis* are also slightly larger, more consistently grayed and the front of the female is silvery to the vertex instead of shining.

Male. Head: Compound eyes joined for about half the length of the front; front and face silvery, vertex shining; occiput gray pollinose, subshining in ground color; third antennal segment yellow-brown to black, very long acuminate (fig. 23a). *Thorax:* Opaque, brownish pollinose on the dorsum, gray on the margins; pleurae and metanotum cinereous; humeri yellow, propleurae bare, knobs of halteres yellow-brown to black, stems pale; extremities of femora, most of tibiae and first four tarsal subsegments yellow, femora otherwise black; median portion of tibiae discolored with brown; femora rather slender, spines weak; apical bristles of front and middle tibiae strong. *Wings:* Stigma completely filling third costal section; third section slightly longer than fourth; fifth section about equal to third and fourth together; crossvein r-m situated at, or just beyond, the end of subcostal vein and at basal one third of discal cell; ultimate section of fourth vein (M_{1+2}) straight (fig. 23b); wings slightly iridescent. *Abdomen:* Opaque brownish, cinereous on first and lateral margins of segments two to five, with faint cinereous vittae on apical margins of segments. *Hypopygium* rather small, symmetrical, but little over one half as long as fifth segment (fig. 23e). Usually there is no indication of an apical membranous area from dorsal view, however, in some specimens a small area is visible. A small portion of seventh segment is visible from dorsal

view. Ninth segment and harpagones yellowish. From ventral view a small membranous portion is visible at apex of eighth segment. The ninth is about as broad as long, with a marked indentation on outer margin near base and a shallow 'U' shaped cleft on posterior margin. Inner harpagone very broad and blunt; outer broad at base but produced apically into a long fingerlike development (fig. 23f). Cerci small.

Length: body, 3.5-4 mm.; wings, 4.4-5 mm.

Female. Front chiefly silvery, shining black near vertex; occiput moderately swollen, chiefly cinereous. Ovipositor short, piercer about equal to the base in length and extending to the apex of the fourth segment; base globose (fig. 23e).

Length: body, 3-3.8 mm.; wings, 4-5.5 mm.

Type locality: Cottage Beaulieu, Quebec.

Type in Boston Society of Natural History collection.

The writer has studied the type series; also specimens from the following states and provinces: Alberta, Arizona, British Columbia, California, Colorado, Illinois, Iowa, Kansas, Massachusetts, Michigan, Minnesota, Montreal, Missouri, Nevada, New Hampshire, New Jersey, New Mexico, New York, North Carolina, North Dakota, Nova Scotia, Ohio, Oklahoma, Ontario, Pennsylvania, Quebec, Utah, Virginia and Wyoming.

Dorilas (Dorilas) alpinus (Cresson)

(Plate 4, figs. 24a-b)

Pipunculus alpinus Cresson, 1911, Trans. Am. Ent. Soc. XXXVI, 306.

This is near *fuscus* var. *nitidiventris* Loew but is distinguished by its long slender ovipositor.

Female. Head: Antennae brown to black; third segment short acuminate (fig. 24a), slightly more pointed than in *fuscus* Loew; front silvery to the vertex. *Thorax:* Subshining in ground color, dusted with brown pollen dorsally, grayed on the margins and cinereous on pleurae and metanotum; dorsum of thorax rather thickly pilose, with short yellow to brown pile; dorsum of abdomen sparsely covered with pale pile; propleurae with a distinct brush of long yellow hairs; extremities of femora and most all of tibiae and tarsi yellow, legs otherwise black; median portion of tibiae often discolored with brown and last tarsal segments usually brown to black. Wings as in *fuscus* with third costal section equal to fourth; r-m crossvein at about the basal one fourth to one fifth of discal cell and last section of fourth vein sinuate. *Abdomen:* polished ex-

cept for cinereous first segment, bases and sides of second segment and lateral margins of three to five. Ovipositor elongate, piercer slender, about twice as long as its base, reaching to or near the base of the abdomen and distinctly curved; base rounding and slightly tuberculate below (fig. 24b).

Length: body, 3.7-4.5 mm.; wings, 4.2-5.0 mm.

Male unknown.

Type locality: Mt. Equinox, Vermont.

Type in Boston Society of Natural History.

The writer has examined the type series; also homotypic specimens from Mt. Washington, N. H., 2,000 ft., VII-24-1915 (C. W. Johnson). Also specimens from the following localities:

Canada: Aylmer, Que., 22-VI-1924 (C. H. Curran); Saskatoon, Sask., Aug. 16, 1939 (A. R. Brooks).

Maine: Oquossoc, VII-1922 (Johnson); Salisbury Cove, VI-23-25 (Johnson).

New Hampshire: Franconia (Mrs. Slosson); Glen House, VII-20-15 (Johnson).

Utah: Spring Hollow, Logan Canyon, Aug. 7, 1938 (D. E. Hardy, A. T. Hardy); Moab, June 4, 1940 (G. F. Knowlton, F. C. Harmston).

Dorilas (Eudorylas) alternatus (Cresson)

(Plate 4, figs. 25a-c)

Pipunculus alternatus Cresson, 1911, Trans. Am. Ent. Soc. XXXVI, 286-287.

Because of doubt concerning this species the writer prefers to quote the original description of both sexes:

"*Male*. Front brownish or grayish; face silvery; antennae brownish-black, with third joint broadly acute. Mesonotum bare, opaque brown; lateral and broad anterior margins cinereous, with rudiments of a pair of median brown vittae. Scutellum opaque-brown; pleurae and metanotum cinereous; halteres and humeri brown or blackish. Abdomen opaque, with bases of all segments velvety-brown; apices and broad lateral angles cinereous and more shining; segments 2-4 subequal and fifth as long as third and fourth together. Hypopygium small, much shorter than fifth, with a shallow apical cleft. Legs black, grayish, with apices of femora, bases of tibiae, and tarsi, yellow; flexor and inner surfaces of post-femora polished. Wings hyaline with stigma twice the fourth section. Length, 3.8 to 4.4 mm.; wings, 5.3 to 5.6 mm.

"*Female*. Front and face silvery, former with a fine median black vitta expanding into the shining vertex; antennae with third-joint acute and minutely spiniform apically. Mesonotum opaque-brown, anteriorly and laterally cinereous. Ovipositor long, straight and yellow. Similar to fig. 54²¹ but longer, ex-

21. 1911, Trans. Amer. Ent. Soc., V. XXXVI. E. T. Cresson, Jr.

tending to base of abdomen, abruptly terminating its small shining black globose base. Wings hyaline with short stigma, only one-half as long as fourth section. Length, 4.2 mm.; wings, 4.5 mm."

Type locality: Clouderoft, New Mexico.

Type at Philadelphia Academy of Natural Science.

The writer has examined the type series and compared a group of specimens with the types and found that there are apparently one or two subspecies or perhaps distinct species which run to *alternatus*. The female in the type series does not appear to belong to the same species as the males; this may, however, be an extreme case of sexual dimorphism. In the paratype female the antennae are more pointed below, broadly acute to obtuse in males; the third costal section of the wing is about one half the length of the fourth section in female, almost twice as long in the males; the stigma is shorter than third section in female and completely fills it in males.

The following additions to the description are based upon the type series: Ultimate section of fourth vein straight; apical cell very narrowly open at apex; crossvein r-m situated at basal one fourth of the discal cell; petiole of anal cell long. Hypopygium of male very short, about one fifth the length of fifth segment, with a shallow apical cleft and a depressed area on the left side (fig. 25c). Female ovipositor with a distinct tubercle at base, beneath. No brush of hairs on the propleurae.

The female specimens in the writer's collection compared in most respects with the paratype female, but have the front more shining, third costal section slightly over one half the fourth, abdomen more cinereous and the ultimate section of the fourth vein sinuate. Crossvein r-m situated nearer middle of discal cell. These are related to *abberatus* (Hardy-Knowlton) but the piercer of ovipositor is longer and the base more rounding. These specimens may belong to a subspecies or to a distinct species. The males at hand are possibly a different species from those in type series; the hypopygium is differently shaped and cleft on the right. These specimens are from a wide range of localities and their position cannot be definitely established until the males and females of *alternatus* are more surely associated.

The writer has collected in the type locality but took no specimens of this. A series of females from Chiricahua Mountains, Arizona, July 4, 1940 (R. H. Beamer, D. E. Hardy) appears to belong here.

Dorilas (Dorilas) angus (Cresson)

(Plate 4, fig. 26a)

Pipunculus angus Cresson, 1911, Trans. Am. Ent. Soc. XXXVI, 305.

This is probably not a distinct species and perhaps should be considered a subspecies of *fuscus* (Loew). It is apparently distinguished from *fuscus* var. *nitidiventris* (Loew) by the shining black front and by the shape of the ovipositor. The base of the ovipositor is more globose and the piercer more abruptly terminating its base in the typical *angus* (fig. 26a) as compared with the more elongate base and gradually tapering piercer of *fuscus nitidiventris*. The femora are also more shining black medianly in the typical *angus*. These variations have been covered in the series of *fuscus nitidiventris* (Loew) which the writer has examined but since *angus* is based upon a unique female and no males have been associated from the type locality its specific ranking is maintained; further collecting in the Southwest will clarify this matter.

Length: 3.5 mm.; wings, 5.5 mm.

Male unknown.

Type locality: Clouderoft, New Mexico.

Type at Philadelphia Academy of Science.

The writer has a homotypic specimen from Goldstream to Downie Creek, Selkirk Mts., Br. Col., Aug. 7-11, 1905. Specimens from the following localities appear to belong to this species.

Massachusetts: Holliston, Aug. 16 (Banks).

New Jersey: Ramsey, June 16, 1916.

Collecting in the type locality has failed to produce further specimens of this, although female specimens of the typical *ater-fuscus* group were taken. Both male and female specimens of *fuscus* var. *nitidiventris* have been taken in similar habitats throughout the Southwest.

Dorilas (Eudorylas) apicalis (Hardy-Knowlton)

(Plate 4, figs. 27a-c)

Pipunculus apicalis Hardy-Knowlton, 1939, Can. Ento. LXXI, 88-89.

This species is related to *cinctus* (Banks) but is readily separated by its larger size; shorter, acute third antennal segment (fig. 27a); abdomen with distinct gray fasciae and the sides nearly straight, being about the same width from segment one to four; the hypopygium is very small, not over one third the length of the fifth segment.

The following is the original description with a few added notes on the wing characters:

"*Male*. Front and face silvery, front with a velvety black spot in center. Second segment of antennae black with one or two long hairs below and numerous bristles above; third segment black with white pubescence, short acute, white fringe on dorsal margin. Mouthparts yellow-brown to black. Occiput silvery gray pollinose.

"Thorax subopaque on the dorsum, silvery gray pruinose on the sides, pleurae and metanotum. Scutellum sub-shining with two pairs of rather strong bristles on the posterior margin. Mesonotum and scutellum covered with dense yellow, recumbent, microscopic pubescence. Humeri grayish yellow; knobs, of halteres black, stems yellow-brown. Coxae gray cinereous, median pair with several black bristles dorsally; trochanters subshining black, posterior pair with a small patch of short pale bristles near their bases. Femora and tibiae opaque black except for yellow apices of femora and bases of tibiae. Posterior femora shining on inner edges, tarsi brownish black, basitarsi yellowed basally. Femoral bristles rather weak, tibiae and tarsi clothed with short black hairs, one long bristle on dorsal edges of posterior tibiae; tarsal brushes dense yellow, some longer hairs at the apices of tarsal segments. Segment five with three long bristles apically. Tarsal claws and pulvilli yellow, tips of claws black.

"Abdomen silver-gray pruinose on the sides, fasciated with gray along posterior margins of segments one to four, the fascia broader on the sides, the anterior half to three-fourths of each segment opaque black, fifth segment subopaque, the gray fascia extending for a short distance toward the middle from the sides; fifth segment with two indentations on each side toward the posterior margin. Hypopygium very short, subshining and with an apical cleft (fig. 27c). Lateral comb of first segment composed of four to five black bristles.

"Wing hyaline with an iridescent tinge, stigma very slightly tinged, but not distinctly brown."

Third section of costa twice the length of the fourth (fig. 27b), stigma filling only apical three fourths of section becoming very faint behind; fifth costal section about equal to the third and fourth combined. Crossvein r-m situated beyond the end of the subcostal vein and at basal one third of the discal cell; ultimate section of the fourth vein straight, last section of fifth shorter than the posterior crossvein, cubital cell with a very long petiole.

Length: body, 3.8 mm.; wings, 4.7 mm.

Type locality: Spring Hollow, Logan Canyon, Utah.

Type at Utah State Agricultural College.

Dorilas (Eudorylas) aquavicus n. sp.

(Plate 5, figs. 28a-f)

This species belongs in the *atlanticus* group by having the ninth segment greatly enlarged, the inner harpagone strongly produced, acute third antennal segment and yellow legs. It is distinguished from other species in this complex by the unusual shape of the inner harpagone, this structure is greatly enlarged and rounded apically

and possesses an acute process on under side; the spine-like developments on the posterior margin of the sixth sclerite are also distinctive. The females are best separated from *atlanticus* by the narrower front and tuberculate ovipositor base.

Male. Head: Eyes very narrowly separated on the front, frontal triangle and face silvery pubescent, upper portion of front subshining black; antennae black, bristles of second segment strong; third antennal segment short acute (fig. 28a), densely whitish pubescent; mouthparts yellowish, palpi enlarged and rounding at the tips. *Thorax:* Subshining in ground color, densely brownish pruinose on the dorsum, grayed on the margins and pleurae; dorsocentral and marginal hairs weak, propleurae bare; metanotum cinereous with a distinct transverse furrow; humeri black, stems of halteres yellow, knobs brown to black. *Legs:* Chiefly yellow, except for blackish coxae and brownish apical two to three tarsal subsegments. Femora rather slender, ventral bristles weak; hind tibiae slightly arcuate, apical bristles of tibiae undeveloped; posterior basitarsi about equal in length to the next four subsegments; pulvilli large, almost as long as the tarsal claws. *Wings:* Third section of costa about equal to fourth, fifth section one and one half times as long as fourth; stigma dark brown, completely filling third costal section. Crossvein r-m situated near basal one third to one fourth of discal cell, ultimate section of fourth vein sinuate. *Abdomen:* Broad and rounding at the sides, widest at segments three to four. Anterior one half to three fourths of each segment brownish, apical portion and lateral margins cinereous; the gray vittae are interrupted with brown medianly; fifth segment scarcely longer than the fourth and about equal to length of the third. *Hypopygium:* Very broad and rounding, one and one half times the length of the fifth abdominal segment; seventh sclerite plainly visible from dorsal view, occupying most of the left side, from base of eighth to fifth segments; eighth segment rounding, with a depressed area above, on right side; ninth segment yellow, plainly visible from dorsal view (fig. 28f). From ventral view the broad ninth segment is seen to be much larger than the eighth and there is no apparent membranous portion; ninth segment about as broad as long, apical cleft shallow; inner harpagone greatly developed and rounding on apical half, attenuated below middle and enlarged on inner basal portion into a square lobe; on ventral portion of outside edge a strong spurlike process is present at about middle, as seen from side view (fig. 28e); outer harpagone gently tapering into an acute point at apex (fig. 28b); sixth sclerite

developed into a pair of sharply pointed projections on posterior margin (fig. 28e). These points fit just beneath the inner harpagone. Cerci small, not greatly developed.

Length: body, 4.6-4.8 mm.; wing, 4.3-5.5 mm.

Female. Eyes rather narrowly separated, front much wider, however, than the width of the median ocellus; silvery pubescent on lower one half with a shining black stripe extending from ocellar triangle about half way down the front. Base of ovipositor largely black, piercer yellowish; piercer about equal to base and sharply pointed; base of ovipositor strongly tuberculate below (fig. 28d). Otherwise like the male.

Holotype ♂ : Tajique, New Mexico, June 25, 1940 (D. E. Hardy). Allotype ♀, same locality and date (R. H. Beamer). Seven paratypes, two ♂♂, one ♀ same data as type and two males, two ♀♀, Ruidoso, New Mexico, June 26, 1940 (R. H. Beamer, D. E. Hardy). These specimens were taken hovering over the water of a small mountain stream. All are in Snow Entomological Collection.

Dorilas (Dorilas) ater (Meigen)

(Plate 5, figs. 29a-f)

Pipunculus ater Meigen, 1824, Sys. Besch. der bekannten europ. Zweifl. Ins. IV, 23.

Pipunculus cingulatus Loew, 1865, Centuria vi. Berl. Ent. Zeit., IX, 176.

Pipunculus fuscus Cresson (nec Loew), 1911, Trans. Amer. Ent. Soc. XXXVI, 301.

Pipunculus horvathi Kertész, 1907, Ann. Musei Nationalis Hungarici, V. P. 579-580.

Pipunculus townsendi Malloch, 1913, Proc. U. S. N. M. 43, 292.

Pipunculus campestris Verrall (nec Latreille), 1901, Brit. Flies, VIII, 99-103.

Pipunculus dentipes Meigen, 1838, Syst. besch. der bekannten europaischer zweifl. Ins. VII, 146.

Pipunculus dispar Zett., 1840, Ins. Lapp. 3, 579.

Pipunculus wolffi Kowarz, 1886, Wien. Ent. 3, VI, p. 152.

Specimens of *ater* from Germany were compared with the type of *cingulatus*, No. 453 in the Cambridge Museum of Comparative Zoology and found to be conspecific with it. The writer was unable to find even subspecific characters by which they could be distinguished. In any series of this species there is a certain amount of variation in the extent of opaqueness of the abdominal segments and the coloration of the legs, there was far less variation to be seen in the European and American specimens compared than exists in many local series.

This synonymy gives rise to the question, how was this species established in America? Due to their parasitic nature it would be possible for their larvae to be imported within the bodies of leafhoppers on plants or their pupae could be transported in soil or debris.

The writer has found that many of our American DORILAIIDAE are

very close to European species and further comparisons may prove others to be synonymous.

This species is very near to *fuscus* (Loew) and can only be separated conveniently by the male genitalia, this is sometimes questionable and *fuscus* may actually only be a variety of *ater*.

Male. Head: Front silvery to yellow-brown pubescent, face silvery, eyes joined for about one half the length of front; occiput moderately swollen, entirely gray; antennae acute, brown to black (fig. 29a). *Thorax:* Mesonotum faintly shining, brown dusted, grayish on the margins with rather thick erect pale pile; scutellum more distinctly shining; pleruae and metanotum gray; humeri black, halteres yellow to brownish; propleurae with a brush of long yellow hairs on hind margin, pleurae otherwise bare; legs chiefly black, bases and apices of femora and tibiae and first four tarsal sub-segments usually yellow; the extent of coloration on the legs varies a great deal and cannot be used as a specific character; the tibiae may be wholly yellow with only faint median discolorations or may be almost entirely black; legs clothed with long, pale hairs, femora slightly swollen, femoral spines well developed on apical portion beneath; posterior tibiae gently arcuate. *Wings:* Faintly brownish tinged, third section of costa just slightly longer or equal to fourth section, stigma filling third section; fifth section about equal to the combined third and fourth in length. Crossvein r-m at about the end of the subcostal vein and at the basal one fourth of discal cell; ultimate section of fourth vein sinuate (fig. 29b). *Abdomen:* First abdominal tergum gray, segments two to five opaque brownish black to velvety basally and brightly polished apically; the extent of opaqueness varies a great deal, in the typical condition it extends on the basal two thirds of segments two and three, basal one half of segment four and basal one fourth of segment five. All degrees of intergradation may be found from more shining to entirely opaque (variety *velutinus*), abdomen with sparse pale pile. *Hypopygium:* Greatly developed, with a large dorso-apical cleft and moderate to strong apical keel; in some specimens the keel may be much more pronounced depending upon the degree of extension. The cleft of the eighth segment extends from the apex around the keel toward the basal part of the segment, being plainly visible from above and simulating a large depressed area extending two thirds to three fourths the distance toward the base on the right side of the dorsum (fig. 29d); ninth segment and harpagones black, harpagones symmetrical, rather long and slender (fig. 29c), ninth sclerite with a 'U' shaped cleft in middle on apical margin.

Length: body, 3.5-5.0 mm.; wings, 4.5-5.6 mm.

Female: The female of this species has long been known as *horvathi* (Kertész), the writer has definitely associated the sexes. In general they differ but slightly from the males; the eyes are broadly separated on the front, wider in the middle than the width of the front just above the antennae; front entirely silvery or with but a faint subshining line running part way down the middle from the vertex. Abdomen brightly polished; excepting the first tergum, the segments are only cinereous on the sides, no appreciable opaque fascia at the bases of the segments. Base of ovipositor rather elongate, black to yellowish apically, piercer yellow, about as long or slightly shorter than and gently tapering from its base. Piercer extending just beyond anterior margin of second abdominal segment (fig. 29f).

This is apparently the species which Cresson described as *P. fuscus* Loew.²²

Species originally described from Europe.

Type possibly at the Paris Museum.

This species has been taken by the writer commonly associated with *Phlepsius irroratus* (Say) and *Forcipata* sp. also with Agallian leafhoppers on oak; they possibly parasitize several species.

This is one of the most common and widely distributed American as well as European species, having been recorded from the following states and Canadian provinces: Arizona, California, Georgia, Colorado, District of Columbia, Indiana, Illinois, Iowa, Kansas, Maine, Massachusetts, Michigan, Minnesota, Missouri, New Hampshire, New Jersey, New Mexico, New York, North Carolina, North Dakota, Ohio, Ontario, Pennsylvania, Quebec, South Dakota, Texas, Vermont, Virginia and Wisconsin.

Dorilas ater var. *velutinus* (Cresson)

Pipunculus cingulatus velutinus Cresson, 1911, Trans. Amer. Ent. Soc. XXXVI, 300. New Combination.

Differs from the typical *ater* in having the abdomen entirely opaque velvety brown.

Type locality: Swarthmore, Pennsylvania.

The writer has examined the type at the Philadelphia Academy of Science, also specimens from the following states: Arizona, Iowa, Kansas, Michigan, New Mexico, New York, Pennsylvania, also Alberta and Nova Scotia, Canada.

22. 1911, Trans. Am. Ent. Soc. XXXVI, 301.

Dorilas (Eudorylas) atlanticus (Hough)

(Plate 5, figs. 30a-g)

Pipunculus atlanticus Hough, 1899, Proc. Bost. Soc. Nat. Hist. XXXIX, 80.

Large, well-defined species, widely distributed and characterized by its yellow legs, black humeri and halteres, and distinctive reproductive structures. This is one of the largest species of *Dorilas* known from the Nearctic region.

Male. Bare species. *Head:* Very large, occiput wide, densely cinereous; hind margin of compound eyes slightly arched inward; front and face silvery, mouthparts yellowish; compound eyes very narrowly separated on the upper portion of front by a thin yellowish line, this gradually widens toward the vertex; ocellar triangle shining; antennae yellow-brown, third segment short acute to obtuse below (fig. 30a), densely pale pubescent; arista black, the three segments plainly visible. *Thorax:* Mesonotum and scutellum brown pollinose, margins gray; pleurae and metanotum cinereous; propleurae without a brush of hairs; humeri and knobs of halteres brown to black, stems of halteres yellowish; legs except coxae and last tarsal segments bright yellow, femora sometimes faintly discolored medially; femora rather slender, spines very weak; outer surfaces of femora and tibiae with a silvery sheen, produced by presence of microscopic pubescence. *Wings:* Faintly iridescent, third section of costa slightly longer to equal to the fourth section, stigma completely filling third section; fifth section shorter than third and fourth combined; third section of fourth vein (portion from r-m crossvein to m) strongly curved downward, last section of fourth vein sinuate; crossvein r-m situated at basal one third to one fourth of discal cell and at about the end of the subcostal vein (fig. 30b). *Abdomen:* Very broad, short and somewhat rounding; subopaque black in ground color; tergum of first segment and lateral margins of other segments cinereous, faintly gray on apices in typical specimens, otherwise subopaque brownish; the amount of gray on the abdomen varies a great deal, some specimens have distinct cinereous fasciae on each segment. *Hypopygium:* Greatly developed, larger than fifth segment and symmetrical in outline. Sixth segment often narrowly visible at base of hypopygium, seventh segment forming a lateral plate on left side, eighth broad and rounding with a distinct indented area or depression on the right side and a small membranous portion at apex; ninth segment yellow, plainly visible from above (fig. 30f.) From left lateral view the sixth and seventh segments are seen to be well developed and twisted under (fig. 30d);

the sixth selerite is developed into a pair of blunt lobes on posterior edge (fig. 30e); the elongate inner clasper fits in the groove between these in resting position; the left harpagone is developed into a long straplike process, which is enlarged apically; basal portion of this harpagone broad and produced into a rounded process below; this basal portion is covered with long fine hairs; the right harpagone is very differently shaped, does not have the elongate process but has a fingerlike development apically on inner margin and two small rounding lobes developed below (fig. 30d). The aedeagus is likewise very complex; the penis itself appears to be a simple shaft, ending in a sharp point; this is retracted into the phallobase; the aedeagus has well-developed supporting basal structures; these are irregular and difficult to interpret. The claspers are usually folded down into the genital chamber so unless the genitalia is extended it is seldom possible to obtain a clear view of their shape.

Length: body, 4.5-5.5 mm.; wings, 5-6.5 mm.

Female. Front silvery, not as wide as face; abdominal segments usually more distinctly gray vittate; base of ovipositor black to yellowish, enlarged and somewhat quadrate in outline; piercer yellowish to brown, but slightly longer than and abruptly terminating its base (fig. 30c.) Otherwise like the male.

Type locality: Massachusetts.

Type in the Field Museum at Chicago.

This is a rather common and widely distributed species. The writer has examined specimens from the following states and Canadian provinces: Alberta, Arizona, California, Colorado, Connecticut, Florida, Illinois, Kansas, Massachusetts, Maine, Michigan, Minnesota, New Hampshire, New Jersey, New York, North Carolina, Ohio, Ontario, Pennsylvania, Quebec, Rhode Island, South Dakota, Texas, Utah and Virginia.

Dorilas (Dorilas) banksi (Aczel)

(Plate 5, figs. 31a-d)

Pipunculus banksi Aczel, 1940, Zool. Anz. 1.12, Bd. 132, Heft 78, 152.

Pipunculus terminalis Banks (nec Thompson), 1915, Psyche, Boston 22, 168. Change of name. *P. terminalis* was first proposed by Thompson 1869, Opusc. Entom. IV, p. 115. *Dorilas banksi* Hardy is just a manuscript name.

This is a very well-defined species related somewhat to *caudatus* var. *discolor* (Banks) and to *nigripes* (Loew) but is distinctly different; it is the smallest known species in the genus and one of the smallest in the family.

Male. Chiefly brown to black species, almost entirely devoid of

pile. *Head*: Antennae brown to black, third segment small, bluntly rounding below (fig. 31a); front opaque brown with a small shining triangular area extending up from between the antennae; face faintly gray dusted; mouthparts yellowish; eyes closely joined on upper two thirds of front, right up to the ocellar triangle; occiput gray on lower portion, opaque brownish to subshining black on upper portion. *Thorax*: Subshining in ground color, entirely covered with dense brown pruinosity; sternopleurae chiefly subshining; metanotum faintly grayish; humeri black, halteres yellow-brown; propleurae with three or four long yellow hairs on hind margins; legs mostly blackish, sometimes faintly yellowish tinged; posterior tibiae slightly arcuate; femoral spines very weak only a few pairs discernable near the apices. *Wings*: Faintly iridescent; third section of costa elongate, almost three times the length of the fourth section; stigma almost completely filling third section; fifth costal section shorter than third and fourth combined, about equal to the third section in length; crossvein r-m at about the basal one third of the discal cell, last section of fourth vein (M_{1+2}) but slightly curved, the apical cell narrowing very gradually from the posterior crossvein to the wing margin. Posterior crossvein about equal to the last section of the fifth vein in length (fig. 31b). *Abdomen*: Somewhat rounding on the sides, broadest at segments three to four; velvety brown to black, except the apical two thirds of segment five and the hypopygium which are subshining to nearly polished; sparsely dusted with microscopic scales. Segments one to four about equal in length; segment five is almost twice as long as four. *Hypopygium* almost quadrate in outline with a large apical cleft, almost as long as the fifth segment from dorsal view (fig. 31d); ninth segment black, harpagones yellowish; harpagones apparently symmetrical.

Length: body 2-2.5 mm.; wings, 2.8-3.2 mm.

Female. Face narrow, silvery pubescent with a thin dull black line down the center; mouthparts yellowish. Front slightly convex in the middle just above the antennae, shining black with a narrow strip of silvery pollen along the inner margins of the eyes. Extreme apices of femora and tibiae, and bases of tibiae yellow. Abdomen opaque brownish gray pollinose, more grayed on the sides, segment six slightly shining. Base of ovipositor brownish black, merging into yellow-brown as the ovipositor tapers down; piercer of ovipositor reaches to the anterior edge of segment three in the specimens at hand, but the posterior portion of the abdomen is some-

what curved under. Ovipositor stout and broadly tapering, piercer about equal to base in length (fig. 31c).

Length: body, 2.5-3 mm.; wing, 4 mm.

Type locality: Falls Church, Virginia.

Type in Cambridge Museum of Comparative Zoölogy.

The writer has studied the type material and has homotypes from: Falls Church, Va., May 23-Aug. 2 (Nathan Banks); Great Falls, Va., June 16-29-Sept. 24 (N. Banks); Logan Canyon, Utah, Aug. 7-Sept. 4, 1938 (D. E. Hardy, A. T. Hardy, G. S. Stains). Specimens have also been examined from the following localities: Sequoia National Park, California, Aug. 6, 1940 (R. H. Beamer, D. E. Hardy, E. E. Kenaga); Sunnyside Canyon, Huachuca Mts., Arizona, July 9, 1940 (R. H. Beamer, E. E. Kenaga, D. E. Hardy); Sandpoint, Idaho, July 3, 1917 (H. G. Dyar); Vinton, Ohio, July 5-12, 1900 (Jas. S. Hine); Kentville, N. S., July 28, 1924 (R. P. Gorham).

Dorilas (Eudorylas) bidactylus n. sp.

(Plate 5, figs. 32a-c)

This species is related to *caudatus* var. *discolor* but the male hypopygium is more rounding, not so quadrate, apical depression not so large. The harpagones are much different in shape, the outer one being developed into two lobes apically and the inner more elongated, terminating in an obtuse apex. Species more consistently black.

Male. Almost completely bare species. *Head:* Eyes joined on upper two thirds of front; frontal triangle and face silvery pubescent; antennae black, bristles of second segment rather weak; third segment acuminate below (fig. 32a). *Thorax:* Shining black in ground color, dusted rather thickly with brown on the top of mesonotum; pleurae and sides of mesonotum grayish; scutellum largely shining; metanotum gray, rather evenly convex, with but a faint indication of a transverse furrow; humeri yellow on upper halves; stems of halteres yellowish tinged, knobs black; dorsocentral hairs very weak, propleurae bare; legs chiefly black, bases of tibiae yellowish; femora slender, femoral bristles weak, moderately developed on the venters. *Wings:* Lightly iridescent; third section of costa slightly longer than the fourth; fifth section about three fourths the length of third and fourth combined; crossvein r-m situated just beyond end of subcostal vein and at about basal one third of the discal cell; ultimate section of fourth vein straight, last section of fifth about equal in

length to the posterior crossvein. *Abdomen*: Sides almost straight, slightly wider at segments two to four; thickly brownish pruinose on the dorsum, grayed on the sides. *Hypopygium*: Subshining, about one and one fourth times the length of fifth abdominal segment; somewhat quadrate in outline but more symmetrical than in *caudatus*. Seventh sclerite plainly visible from dorsal view; eighth segment almost as long as broad, with a conspicuous apical depressed area slightly to the left side (fig. 32b). From ventral view the membranous area of the eighth segment is seen to be rather small; the ninth segment is a little longer than wide, with a distinct indentation on outside margin near base and a small groove on both sides near apex; the cleft on hind margin of the ninth is 'U' shaped. Harpagones* broad at bases, the outer one rather short and produced apically into a pair of blunt lobes; the inner harpagone is longer, gently tapered into an obtuse apex, with a square niche on outer margin just below apex (fig. 32c). Cerci moderate in size extending just beyond the posterior margin of ninth segment.

Length: body, 3.4 mm.; wing, 3.6 mm.

Female unknown.

Holotype ♂: Chiricahua Mts., Arizona, July 4, 1940 (D. E. Hardy). Paratypes: three ♂♂, same locality and date as type (R. H. Beamer, D. E. Hardy); one ♂, Duck Lk., Conquest, N. Y., Aug. 5, 1921 (Shannon) and one ♂, Bath, Michigan, June 6, 1940 (C. W. Sabrosky).

One paratype returned to Cornell University, and one to Michigan State College. All other types in Snow Entomological Collection.

Dorilas (Eudorylas) caudatus (Cresson)

(Plates 5-6, figs. 33a-c)

Pipunculus caudatus Cresson, 1911, Trans. Amer. Ent. Soc. XXXVI, 289-290.

Male. Head: Front and face silvery pubescent; that portion of front below ocelli shining black; eyes joined for about the length of the front above antennae; upper occiput dull gray, sides and lower portion cinereous; antennae black; third segment acuminate. *Thorax*: Shining in ground color, thickly covered with brownish to gray pollen, metanotum and pleurae cinereous; humeri and knobs of halteres black; apices of femora and tibiae and bases of tibiae yellow; first four tarsal subsegments yellowish; fifth subsegment brown; trochanters sometimes yellowish tinged; femoral spines rather well developed on hind legs; apical bristles of front and

middle tibiae strong. *Wings*: Faintly iridescent; third section of costa slightly longer than the fourth, stigma completely filling third section; fifth section shorter than third and fourth combined; cross-vein r-m at about the end of the subcostal vein and at basal one third of discal cell; last section of fourth vein straight, slightly longer than third section of that vein (fig. 33a). *Abdomen*: Subshining to opaque brownish, lateral margins of segments only faintly grayed, no vittae on the dorsum other than on segment one; sides of abdomen slightly rounded, widest at segment three. *Hypopygium* large, quadrate in outline, as long to longer than fifth segment from dorsal view and with a rather large apical depression; seventh tergum plainly visible from above (fig. 33b); ninth segment brownish yellow, elongated, longer than wide and longer than eighth segment; apical cleft 'U' shaped. Harpagones yellowish, broad, rather symmetrical, elongated into slender fingerlike lobes apically; the apical portions bend downward in normal position (fig. 33c); cerci small.

Length: body, 3.5 mm.; wings, 3.8 mm.

Female unknown; very possibly is known as some other species. It has not yet been associated with the male.

Type locality: Sea Cliff, Long Island.

Type in Cambridge Museum of Comparative Zoölogy.

The writer has studied the type and has examined specimens from the following states and provinces: British Columbia, Massachusetts, Maine, New Jersey, New York, Ohio, Ontario, Quebec, Virginia.

Dorilas caudatus var. *discolor* (Banks)

(Plate 6, figs. 34a-b)

Pipunculus discolor Banks, 1911, Trans. Amer. Ent. Soc. XXXVI, 290. New combination.

Examination of the types of *caudatus* and *discolor* disclosed that these are not distinct species but that only variety differences exist in the two. The name *caudatus* is being used as the typical form by having page priority.

The variety *discolor* differs in having the humeri and bases of femora yellow; abdomen subshining, apices of segments sometimes lightly cinereous. The writer is unable to find other characters which will separate these.

Length: body, 3.5-4.5 mm.; wings, 4.5-5 mm.

Female. Specimens of this sex run to *subopacus* (Loew) and are sometimes difficult to separate unless accompanied by the males. They are best distinguished by the wing venation; ultimate section

of fourth vein straight. The specimens are of slightly larger size, the antennae are more distinctly yellowed and slightly more elongate pointed below (fig. 34a). The sixth tergum curves around the sides of the abdomen and the margins come together on the venter as in *subopacus*: the base is small and globose; the piercer very short, extending to hind margin of fifth segment (fig. 34b); none of the specimens examined had the ovipositor folded into the groove on the venter.

Type locality: Ithaca, New York.

Type in Cambridge Museum of Comparative Zoölogy.

This variety is widely distributed, the writer has examined the type series, also specimens from the following states: Arizona, California, Iowa, Kansas, Massachusetts, Michigan, New Jersey, New Mexico, New York, Ohio, Pennsylvania, Utah and Virginia.

Dorilas (Eudorylas) cinctus (Banks)

(Plate 6, figs. 35a-d)

Pipunculus cinctus Banks, 1915, Psyche, XV, 169.

This species is related to *caudatus* var. *discolor* (Banks) but can be separated by its smaller size, longer third costal section of wing, smaller hypopygium and more distinctly fasciated abdominal segments.

Male. Antennae brown to black; third segment acuminate with a rather long point below (fig. 35a); face and front silvery; eyes joined for about the length of the front. *Thorax*: Mesonotum brownish pollinose, gray on the margins; pleurae and metanotum gray; humeri yellowish brown, more brownish medially and yellowish around the margin (because of this the species is keyed in two different parts of the key); halteres brown with pale stems; femora chiefly black, apices yellow; tibiae yellow with dark discolorations; first four subsegments of tarsi yellow; apical bristles of front and middle tibiae strong and black. *Wings*: Third costal section over twice as long as fourth, stigma completely filling the long third section; fifth section slightly longer than third and fourth together; crossvein r-m beyond end of subcostal vein and at basal one third of discal cell (fig. 35b); ultimate section of fourth vein straight; petiole of cubital cell long. *Abdomen*: Basal halves of segments velvety opaque, apical halves subshining to cinereous, usually rather distinctly fasciated; sides of abdomen broadly rounding, widest at segments two and three and strongly tapering toward the apex. *Hypopygium*: But little over one half the length of the

fifth segment, slightly compressed to the right and with an apical cleft (fig. 35d). From ventral view the membranous area extends more than half the length of eighth segment, sclerotized portion on left side extending to apex; ninth segment as broad as long, with a deep 'V' shaped cleft on hind margin; cleft extending two thirds the length of the segment, on a middle line. Harpagones irregular but rather symmetrical, strongly curved on both margins and greatly narrowed apically. Cerci well developed, extending just beyond apex of ninth segment (fig. 35e).

Length: body, 2.5-3.2 mm.; wing, 3-4 mm.

Female unknown.

Type locality: Falls Church, Virginia.

The writer has examined the type (No. 13554 Cambridge Museum) and has a series of homotypic specimens from Raleigh, North Carolina, September 1, 1926 (C. S. Brimley); Jacksonville, Florida, November 3, 1911 and Griffin, Georgia, Aug. 12, 1939 (R. H. Beamer).

Dorilas cinctus subtilis n. subsp.

(Plate 6, figs. 36a-b)

Because of the structural similarities this is considered a subspecies of *cinctus*. It is distinguished by having the third section of costa about equal in length to the fourth, instead of approximately twice as long. Hypopygium with a more extensive membranous area, as seen from ventral view, the membrane being separated from the ninth segment by just a narrow band of the sclerite on posterior margin. The ninth segment has a small indentation on outer margin near base and the cleft on hind margin is broadly 'U' shaped and not so deep as in typical *cinctus*. The harpagones are more curved and more elongated and the apices are slightly enlarged (fig. 36a). The humeri are typically yellow but may be yellow-brown to blackish in some specimens.

Length: body, 3.3 mm.; wing, 3.6 mm.

Female. Related to *affinis* but different in that the upper two thirds of the front is chiefly shining black; the piercer of ovipositor is long and slender, produced longer than its base; base small and rounding with a distinct tubercle below (fig. 36b).

Holotype ♂: Chiricahua Mts., Arizona, July 4, 1940 (R. H. Beamer). Allotype ♀, same locality and date (D. E. Hardy). Paratypes: seventeen ♂♂, one ♀, same locality and date as type (R. H. Beamer, D. E. Hardy); five ♂♂, three ♀♀, Ruidoso, New Mexico, June 26, 1940 (R. H. Beamer, D. E. Hardy); one ♂,

five ♀ ♀, Sunnyside Canyon, Huachuca Mts., Arizona, Aug. 24, 1940 (R. H. Beamer, E. E. Kenaga, D. E. Hardy); one ♂, Pingree Park, Colorado, July 11, 1937 (C. L. Johnston) and one ♂, Glasco, Kansas, Aug., 24, 1940 (R. H. Beamer). All in Snow Entomological Collection.

Dorilas (Eudorylas) curtus n. sp.

(Plate 6, figs. 37a-e)

This species is related to *vierecki* (Malloch) in having the legs and third antennal segment yellow, also in having the hypopygium with a large apical depressed area. It is distinguished by the short third costal section and minute stigma in the wings; by the larger membranous portion of eighth segment, with only a narrow band of the sclerite on the posterior margin of that segment; cleft of ninth segment not so deep and harpagones not so broad apically; species slightly smaller (compare scale drawings [figs. 37e and 67f] of hypopygia from ventral view).

Male. Moderately sized, almost entirely bare species. *Head:* Eyes and lower portion of front silvery pubescent, upper portion of front shining black; first two segments of antennae black; bristles of second segment rather strong; third segment long acuminate below (fig. 37a), bright yellow in color; first two sections of arista faintly yellowed; mouthparts yellow; palpi bluntly rounding apically. *Thorax:* Shining black in ground color, rather thickly gray dusted on sides, lightly so on the dorsum; metanotum cinereous, evenly convex, with no indication of a transverse furrow; dorso-central and marginal hairs very weak, propleurae bare; humeri black, halteres yellow. *Legs:* Entirely yellow except for blackish coxae and brownish yellow apical subsegments of tarsi. Femora rather slender, ventral spines well developed on apical halves; hind tibiae slightly arcuate, apical bristles very weak; posterior basitarsi about equal to the remaining subsegments of the tarsi. *Wings:* Lightly iridescent; third section of costa slightly more than one fourth the length of the fourth section (fig. 37b); fifth section about equal to third and fourth combined; stigma very small, occupying only the apex of the third section; crossvein r-m situated at about the end of subcostal vein and about basal one third of discal cell; ultimate section of fourth vein sinuate, last section of fifth about equal to length of posterior crossvein. *Abdomen:* Shining black in ground color, faintly dusted with gray on the dorsum, more cinereous on first tergum and on lateral margins; sides slightly rounding, widest at segments three to four. *Hypopygium:* About three

fourths the length of fifth abdominal segment, compressed to the right and possessing a large apical membranous area. The seventh segment is scarcely visible from dorsal view, occupying a very small portion at the base of the eighth segment on the left side (fig. 37d). From ventral view the membranous area is seen to be very extensive, occupying the larger portion of the eighth segment, with only a narrow band of the sclerite separating it from the ninth segment. Ninth segment about as broad as long, apical cleft 'V' shaped, extending about one half the length of the segment on a middle line. Harpagones with broad bases but tapering posteriorly, obtusely pointed on inner apices. Cerci moderately developed, extending beyond hind margin of ninth segment (fig. 37e).

Length: body, 3.5-3.8 mm.; wing, 3.8-4 mm.

Female unknown.

Holotype ♂: Chiricahua Mts., Ariz., July 4, 1940 (D. E. Hardy). Paratypes: two ♂♂, same locality and date as type (R. H. Beamer, D. E. Hardy). All in Snow Entomological Collection.

Dorilas flavitarsis (Williston)

Pipunculus flavitarsis Williston, 1892, Bio. Cent. Amer. III, 87.

The original description does not include sufficient diagnostic characters to distinguish this species clearly; until the type is studied its position will probably remain questionable.

Following is the original description:

"Face and frontal triangle black, silvery-pubescent. Antennae black; third joint in large part yellow, acute, but not produced below; arista black. Thorax black; dorsum and scutellum brownish pollinose; pleurae grey-pollinose. Abdomen blackish-brown, subopaque; the first segment and the hind angles of the following segments opaque grey. Legs black; extreme tip of the femora, tibiae for the greater part, and the tarsi, save their tip, yellow; femora not markedly thickened nor with spines below. Wings nearly hyaline; stigma yellow; anterior crossvein situated beyond the tip of the auxiliary vein; last section of the fourth vein sinuous, without stump; penultimate section of the fourth vein scarcely twice the length of the antepenultimate section. Length 4 millim."

Type locality: México, Chilpancingo in Guerrero.

Type in British Museum.

Dorilas (Eudorylas) fuscitarsis (Adams)

(Plate 6, figs. 38a-c)

Pipunculus fuscitarsis Adams, 1903, Dipterological Contributions,
Kansas University Science Bulletin, II, 36.

The following is a redescription of the type:

This species is related to *caudatus* var. *discolor* (Banks) but may be separated by the elongate third costal section of the wing and the laterad depression of the hypopygium.

Male. Almost bare species, nearly devoid of pile. *Head:* Eyes joined for the greater length of the front, face and front silvery, occiput cinereous; antennae brown to black, third segment short acuminate (fig. 38a), basal two sections of arista yellowish, otherwise black, (antennae broken on type). *Thorax:* Mesonotum subshining black in ground color, densely brown pollinose, grayish on the margins; pleurae and metanotum cinereous, propleurae bare; humeri yellow, halteres brown to black, stems pale; legs chiefly brown to black, apices of femora and tibiae, bases of tibiae and sometimes extreme bases of femora yellow; tarsi brown in type; in other specimens the tibiae and tarsi are chiefly yellow; legs uniformly gray pollinose; femoral spines weak, tibiae almost straight. *Wings:* Slightly iridescent tinged; third section of costa much longer than fourth in length (scarcely longer in some specimens examined), stigma completely filling third section, dark brown in color; fifth section about equal to third and fourth combined; cross-vein r-m situated beyond the end of the subcostal vein and just beyond the basal one third of discal cell; last section of fourth vein faintly curved; cubital cell with a long petiole (fig. 38b). *Abdomen:* Entirely opaque brown, except grayed first segment, in the type; other specimens have light gray vittae on the apices of each segment extending inward from lateral margins but broadly interrupted with brown medianly. *Hypopygium* subshining black, compressed to the right and with a distinct cleft on the right side formed by the coming together of the eighth and ninth segments; hypopygium about as long as fifth segment (fig. 38c); ninth segment chiefly black, folded inward on the right side, the basal portion visible from a dorsal view, harpagones yellow.

Length: body, 4.5 mm.; wing, 5.2 mm.

The female has not been definitely associated. It will probably fit near *alternatus*.

Type locality: Magdalena Mountains, New Mexico.

Type in Snow Entomological Collection.

Added distribution: Indian Creek, Utah, July 27, 1938 (G. F. Knowlton, F. C. Harmston); Logan Canyon, Utah, Aug. 10, 1938 (D. E. Hardy, G. S. Stains); Spring Hollow, Logan Canyon, Utah, Aug. 7, 1938 (D. E. Hardy, A. T. Hardy); Sunnyside Canyon, Huachuca Mts., Arizona, July 9, 1940 (R. H. Beamer, E. E. Kenaga, D. E. Hardy); Onyx, California, July 23, 1940 (R. H. Beamer); Camerons Pass, Colo., August 20, 1940 (R. H. Beamer) and Cloudcroft, New Mexico, June 20, 1902.

Dorilas (Dorylas) fuscus (Loew)

(Plate 6, figs. 39a-d)

Pipunculus fuscus Loew, 1865, Centuria VI. Berliner Ento. Zeitschrift, IX, 175.

Pipunculus cingulatus Cresson (nec Loew), 1911, Trans. Amer. Ent. Soc. XXXVI, 299-300.

New synonymy.

The species described by Cresson as *cingulatus* Loew was actually *fuscus*, his figure of the male genitalia clearly points this out.

The only dependable criterion for separating *fuscus* (Loew) from *ater* (Meigen) is by the male genitalia; these structures are quite distinctive but may show some intergradation.

Male. Chiefly black species with erect pale pile on mesonotum and sparsely distributed yellow hairs on abdomen. *Head:* Eyes joined on upper portion of front for about the length of the frontal triangle; front grayish to brown pubescent, face silvery; mouthparts yellow; antennae brown to black, third segment acute (fig. 39a); occiput rather narrow especially above, lightly grayed on upper portion, cinereous below. *Thorax:* Mesonotum and scutellum brownish pollinose, shining in ground color; pleurae and metanotum faintly cinereous; humeri black, halteres yellow; propleurae with a brush composed of ten to twelve long yellow hairs on posterior margins; coxae brown with yellowish tinge, trochanters usually yellow; extreme bases and apices of femora, tibiae, except for median discolorations, and first four tarsal subsegments yellow, femora otherwise dark brown to black, last subsegments of tarsi brown, posterior metatarsi equal in length to next three tarsal subsegments; femoral spines well developed; apical bristles of tibiae weak. *Wings:* Faintly brownish tinged, iridescent; third section of costa slightly longer than fourth, stigma completely filling third section; fifth section of costa about equal to third and fourth together; crossvein r-m situated at about the end of the subcostal vein, and about the basal one-third to one fourth of the discal cell; ultimate section of fourth vein strongly sinuate (fig. 39b). *Abdomen:* Subcylindrical, sides almost straight, first tergum faintly grayed, segments two to five broadly

opaque brown on basal portions, polished black on apices; apical two thirds of fifth segment polished, other segments only polished on apical one third to one fourth. *Hypopygium*: subopaque asymmetrical, compressed to the right, with an apical cleft and a prominent apical keel; about equal to fifth segment in length. Seventh segment visible from above, on the right side (fig. 39d). From ventral view the membranous area extends about half the length of the eighth segment; the cleft on the apical margin is rather 'V' shaped. The harpagones are broad and densely haired (fig. 39e).

Length: body, 4-5.4 mm.; wings, 4.5-6 mm.

The females are inseparable from *ater* (Meigen) and can only be identified by association with the males. These are the only known species in the genus in which the females cannot be distinguished and this lends further proof of their close relationship.

Type locality: Maryland.

The writer has examined the type No. 454, in the Cambridge Museum.

Specimens are at hand from the following states and provinces: Arizona, British Columbia, California, Kansas, Maine, Maryland, Massachusetts, Michigan, New Hampshire, New York, Ohio, Ontario, Pennsylvania, Utah, Vermont, Virginia, and Wyoming.

Dorilas fuscus var. *nitidiventris* (Loew)

(Plate 6, figs. 40a-c)

Pipunculus nitidiventris Loew, 1865, Centuria vi. Berliner Ento. Zeit., IX, 175. New combination.

Pipunculus sororius Cresson, 1911, Trans. Amer. Ento. Soc. Vol. XXXVI, 305. New synonymy.

Pipunculus viduus Cresson, 1911, Trans. Amer. Ent. Soc. XXXVI, 301-302. New synonymy.

By comparing the types and studying series of homotypic specimens the writer found there were no structural characters by which *fuscus* and *nitidiventris* might be separated, the only difference being that *nitidiventris* has the yellow humeri while those of *fuscus* are black; variations from one to the other have been studied. The type possesses the typical *fuscus* hypopygium with the exception that the cleft is more plainly visible from above (fig. 40b); in this respect it appears to be somewhat intermediate between *fuscus* (Loew) and *ater* (Meigen); the harpagones are broader and not so slender and the membranous area extends almost to the base of the eighth segment on the venter (fig. 40c). On a basis of apparent close relationship *nitidiventris* might best be considered a variety, the name *fuscus* being retained at specific rank as it was the first of the two to be designated by Loew (*fuscus* type No. 454, *nitidiventris* type No. 455).

The females of the typical *fuscus* have not been associated; it is possible that they may fit *nitidiventris* by having yellow humeri or they may be inseparable from *ater*. (Refer to note on *ater*.)

Comparison of the types of *sororius* with *nitidiventris* proved them to be conspecific. Cresson²³ states that he did not know this species but suspected that it was closely related to *horvathi* Kertész by having the abdomen polished and the humeri black. The type male of *nitidiventris* (Cambridge Museum of Comparative Zoölogy) has the humeri yellow.

Banks²⁴ suggested that *sororius* was the same as *nitidiventris* Loew.

Type locality of *nitidiventris*: District of Columbia.

Type in Cambridge Museum of Comparative Zoölogy.

The writer has examined specimens of this variety from the following states and provinces: Alberta, Arizona, British Columbia, Iowa, Kansas, Maine, Maryland, Massachusetts, Michigan, New Hampshire, New Jersey, New York, Ohio, Ontario, Pennsylvania, Quebec, Rhode Island, Saskatchewan, Utah, Vermont and Virginia.

Dorilas (Eudorylas) grandis n. sp.

(Plate 7, figs. 41a-f)

This species is superficially related to *huachucanus* n. sp. in that the eyes of the male are very narrowly separated on the front, the humeri and knobs of halteres are black and the femora largely black; the front of the female is narrow and the base of ovipositor tuberculate. It does not, however, belong in the typical *atlanticus* group as the ninth segment and harpagones of the male are more normal and the eighth not so symmetrical, with a large apical depression. Aside from the above characters it is distinguished from other species in this complex by having the third antennal segment acuminate; by the great development of the sixth and seventh sclerites and the large apical depressed area at apex of eighth. The inner clasper is not so strongly developed and the outer is more elongated and slender. The female may be distinguished from *huachucanus* by its longer third antennal segment and more elongate ovipositor base.

Male. Rather large, opaque, chiefly bare species. *Head*: Large and rather spherical, about two thirds the length of the thorax; eyes very narrowly separated on the upper two thirds of the front; frontal triangle and face silvery pubescent, upper portion of front

23. 1911, Trans. Amer. Ent. Soc. vol. XXXVI; 304.

24. 1915, Psyche, 22, 167.

shining black; antennae black, bristles of second segment strong; one long ventral bristle extends almost to the tip of the third segment; third segment acuminate, densely white pubescent on lower portion (fig. 41a). Mouthparts yellow, palpi clavate. *Thorax*: Subshining black in ground color, densely pollinose, brownish on the dorsum, gray on the margins; pleurae and metanotum not evenly convex, with a distinct transverse furrow at about dorsal one third; humeri and knobs of halteres black, broad bases and narrow apices yellow; tibiae chiefly yellow with faint discolorations medianly; flexor spines distinct on ventral halves of front and middle femora; apical bristles of tibiae weak. *Wings*: Third costal section scarcely over half the length of the fourth section (fig. 41b); fifth section about equal in length to the fourth; crossvein r-m situated at about the end of subcostal vein and at basal one third of discal cell. Ultimate section of fourth vein strongly sinuate; last section of fifth vein about equal to the posterior crossvein in length. *Abdomen*: Sides nearly straight, scarcely rounding; basal one half to two thirds of each tergum opaque brown, the apical portions and sides being cinereous, the vittae interrupted medianly with brown. *Hypopygium*: About equal in length to the fifth, rather symmetrical in dorsal outline but with a large apical depression slightly to the right side. The sixth and seventh sclerites are very well developed, plainly visible from dorsal view, the seventh occupying most of the left side of the hypopygium; the suture separating the eighth from the seventh runs longitudinally on the dorsum (fig. 41e). From lateral view the seventh sclerite is longer than the eighth (fig. 41c), the sixth extends around the venter and gives support to the floor of the genital chamber. Ninth segment yellowish; from ventral view the ninth is about as wide as long, somewhat asymmetrical, with the left side more strongly developed at the apex; apical cleft 'V' shaped and rather deep. Harpagones rather long and slender, inner one more elongated and strongly curved downward on apical portion; the outer is simple, rounded at apex and gently tapering from base (fig. 41d).

Length: body, 4.8-5 mm.; wing, 5.8-6 mm.

Female. Eyes narrowly separated on the front; front on upper one third being but little wider than the median ocellus. Lower two thirds of front silvery, upper one third opaque to subshining black. Base of ovipositor elongate, somewhat tuberculate toward the apical portion, below; piercer slender, sharply pointed, about equal to base in length (fig. 41f).

Holotype ♂: Chiricahua Mts., Arizona, July 4, 1940 (D. E.

Hardy); allotype ♀, same data. One paratype ♂, same locality and date (R. H. Beamer). All in the Snow Entomological Collection.

These specimens were taken hovering just above the water of a small mountain stream. They were apparently there to lap up moisture from wet rocks.

Dorilas (Eudorylas) harmstoni (Hardy-Knowlton)

(Plate 7, figs. 42a-b)

Pipunculus harmstoni Hardy-Knowlton, 1939, Ann. Ento. Soc. Amer. XXXII, 115-116.

Following is the original description:

"Male. Antennae (fig. 42a) shining black; face and front silvery, front slightly raised above antennae and with a narrow black stripe down the middle. Eyes broadly contiguous. Uppermost part of occiput, mesonotum, scutellum and most of abdomen brownish pollinose, very faintly shining. Two indentations on the sides near the posterior edge of mesonotum. Lower portions of occiput, pleurae, coxae, metanotum and sides of abdomen gray pollinose. Humeri whitish, halteres black. Trochanters brownish yellow, apices of trochanters and femora yellow; femora otherwise black, lightly gray dusted. Tibiae and tarsi yellow, tibiae slightly browned medially below. Femoral and tibiae bristles weak, posterior tibiae noticeably curved.

"Abdomen with fifth segment one and one half times as long as fourth. Hypopygium about three fourths as long as fifth, compressed to the left with a basal cleft not extending to the apex (fig. 42b), intermediate lobe slightly visible from above. Abdomen as well as thorax chiefly bare.

"Wings very lightly browned, darkened stigma; third costal section longer than fourth. Last section of fourth vein almost straight; ultimate section of fifth equal in length to the posterior crossvein. Anal cell with a long petiole; r-m crossvein opposite end of auxiliary vein and at basal one fourth of discal cell.

"Length: body, 3.5 mm., wing, 4.2 mm."

Female unknown.

Type locality: Millville, Utah.

Type in United States National Museum.

Dorilas (Dorilas) houghii (Kertész)

(Plate 7, figs. 43a-d)

Pipunculus houghii Kertész, 1900, Wiener Ent. Zeit. XIX, 244. Change of name for *lateralis* Walker (nec Macquart), 1852, Insecta Saundersiana. Diptera; 216.

Pipunculus femoratus Cresson, 1911, Trans. Amer. Ent. Soc. XXXVI, 303.

This species may be distinguished from related species by the thickened femora and yellow legs.

The species recognized in this paper as *pallipes* (Johnson) has previously been erroneously known as *houghii* (Kertész). Study of Walker's type of *lateralis* by Banks and Calvert completely reversed the conception of these species when they found the femora to be thickened and with well developed femoral spines.

Male. Sparsely pilose species; antennae (except arista), mouthparts, humeri, halteres and legs yellow. Third segments of antennae acute (fig. 43a), first two sections of arista yellow, the long flagellum black; front and face silvery, eyes joined above, for about the distance of the frontal triangle; occiput entirely cinereous, more faintly grayed above. *Thorax:* Subshining in ground color, dusted with brown on mesonotum, grayed on the pleurae and metanotum; scutellum shining; propleurae with a conspicuous brush of long yellow hairs on hind margins; coxae black, femora sometimes slightly discolored with brown medianly, last tarsal subsegments brown; posterior femora especially thickened and the femoral spines are well developed, more so toward apex; the posterior tibiae are strongly arcuate and the hind basitarsi almost equal to the next four tarsal subsegments in length. *Wings:* Lightly brownish tinged; third section of costa equal to slightly longer than fourth, stigma completely filling third section; fifth section of costa shorter than third and fourth combined; crossvein r-m at about the end of the subcostal vein and at basal one fourth to one fifth of discal cell; ultimate section of fifth vein very slightly curved (fig. 43b). *Abdomen:* Shining black, grayed on first tergum and lateral margins of other segments, bases of these segments very narrowly opaque. *Hypopygium:* Faintly cinereous, strongly developed and asymmetrical, compressed to the right with a broad cleft and small apical keel; hypopygium almost as long as fifth segment (fig. 43d). Ninth segment and harpagones black; harpagones symmetrical and rather slender.

Length: body, 4.5-5.0 mm.; wings, 5.5-6.3 mm.

Female. Front entirely silvery; strongly narrowed on upper portion near vertex. Thorax and abdomen faintly gray dusted, the polished black ground color shining through. In the paratype female of *femoratus* the sides of segments two to five are faintly and narrowly yellowish on their apical margins; ovipositor rather short and stout, base somewhat elongated (fig. 43c), equal to piercer in length; otherwise like male.

Type locality given as North America.

Type in British Museum.

The writer has examined the type of *femoratus* at the Boston Society of Natural History and also specimens from the following states and provinces: Florida, Georgia, Kansas, Illinois, Maryland, Massachusetts, New York, North Carolina, Ohio, Ontario, Pennsylvania, Rhode Island, Vermont, Virginia and Washington, D. C.

Dorilas houghii apicarinus (Hardy-Knowlton)

(Plate 7, figs. 44a-b)

Pipunculus femoratus var. *apicarinus* Hardy-Knowlton, 1939, Ann. Ento. Soc. Amer. XXXII, 114-115.

This should probably be considered a western subspecies, it differs from the typical *houghii* in having the third segments of the antennae brown to black, stigma and third costal section longer than the fourth section; thorax with two faint median vittae, posterior femora not so strongly incrassate and the membranous area of the hypopygium is more apical and not so extensive; the difference in the hypopygium would suggest that this might be a distinct species.

The following is the original description:

"*Male*. Front, face and occiput silvery, antennae dark brownish to black, second segment with a faint yellowish tinge; third segment conically acute as in typical variety. Halteres and humeri bright yellow. Mesonotum and scutellum with brownish yellow pollen, grayish on the sides with two faint grayish vittae longitudinally. Pleurae and metanotum cinereous, occiput, dorsum of thorax and abdomen covered with fine, short yellow hairs, less dense on the abdomen. Coxae black, the rest of legs yellow, except for the brownish median portions of the femora. Mesothoracic coxae with several long hairs apically, meso and meta-thoracic trochanters each with a few yellow hairs below. Femoral and tibial spines fairly well developed but not so strong as in typical *houghii*.

"Abdomen chiefly shining, first segment whitish pollinose on the sides, somewhat brownish in the middle, other segments only slightly grayed on their sides and anterior margins. Hypopygium almost as large as fifth segment, strongly compressed to the right with an apical cleft and well developed keel (fig. 44b).

"Wing hyaline, somewhat iridescent, third costal section and colored stigma one and one-half times as long as fourth section (fig. 44a). Ultimate section of fourth vein sinuate. Last section of fourth equal to posterior cross vein. Anal cell with a petiole of medium length; r-m crossvein at or but slightly before end of auxiliary vein and at basal one-fourth to one-third of discal cell."

Type locality: Wolf Creek Pass, Utah.

Type in the United States National Museum.

Dorilas houghii var. *curvittibiae* (Hardy)

Pipunculus femoratus var. *curvittibiae* Hardy, 1939, Jour. Kans. Ent. Soc. Vol. 12, No. 1, 19-20. New combination.

This variety is differentiated by having the antennae entirely brown to black; the thorax and abdomen clothed with rather long dense yellow-gray pile; femora brownish black, yellowed only basally and apically. The posterior tibiae are very strongly curved and the femoral spines pronounced. The abdomen is opaque to subshining in ground color, thickly covered with brown pollen above; first segment and lateral margins of two to five cinereous, the cinereous

pollen extending from sides across the apical margins of the segments, interrupted medianly by brown. The hypopygium is typical.

Length: body, 5.3 mm.; wing, 5.8-6 mm.

Female unknown.

Type locality: Cave Cr. Canyon; Chiricahua Mts., Arizona.

Type in the United States National Museum.

Dorilas (Eudorylas) huachucanus n. sp.

(Plate 7, figs. 45a-g)

This species is related to *atlanticus* (Hough) but is easily distinguished by the broad black bands of the femora, black antennae, the very narrow front of the females and the difference in the genital structures of both sexes. The base of the ovipositor is largely black, strongly tuberculate on underside, somewhat squared posteriorly, piercer more slender. From dorsal view the base of ovipositor rounded, not quadrate in outline. The male abdomen is more straight, sides scarcely rounding; the seventh sclerite is visible only at upper left side of hypopygium, not extending toward the apex as in *atlanticus*; the sixth sclerite is very small, never visible from dorsal view. The eighth segment is evenly rounded without an indented area on right side or a visible membranous area at apex as in *atlanticus* and the ninth segment is not visible from dorsal view. From ventral view the seventh sclerite is not so prominent and the ninth segment is much more elongated, not so broad and rounding as in *atlanticus*. The inner harpagone is more strongly curved and flattened apically like a disk, folded up under ninth segment in normal position, not flattened laterally and extended as in related species. The outer harpagone is more acute at apex and also folds in toward the genital chamber in normal position.

Male. Almost entirely bare species. *Head:* Eyes very narrowly separated on upper two thirds of front; the front widens out again just before the ocellar triangle; lower one third of front subshining black in ground color, thinly covered with whitish pubescence, upper two thirds of front shining black; face silvery pubescent, slightly swollen; antennae black, bristles of second segment rather strong; third segment acute (fig. 45a), thickly covered with light pubescence. Occiput moderately developed, lightly dusted with gray on upper portion and densely cinereous below. *Thorax:* Dorsum subshining black in ground color, mesonotum and scutellum thickly covered with brown pollen (microscopic scales); pleurae and metanotum cinereous, metanotum with faint indication of a transverse furrow just above middle; propleurae bare; humeri black; knobs of halteres brownish

black, stems yellowish. *Legs*: All coxae black, anterior and median trochanters black with a yellowish tinge, hind coxae mostly yellow; femora largely black, broad apices and narrow bases yellow; more of the bases yellowed on hind femora; tibiae and basitarsi yellow, other tarsal subsegments blackened, with a yellowish cast; femora slender, femoral spines weak; posterior tibiae slightly arcuate; posterior basitarsi about equal to remaining subsegments; bristles at apex of last subsegment very strong, equaling or longer than the length of the tarsal claws. *Wings*: Much as in *atlanticus*; the third costal section is slightly shorter than the fourth and the fifth section is but little longer than the fourth; the stigma is dark brown in color and occupies all of the third costal section; crossvein r-m is situated at about the end of the subcostal vein and near basal one fourth of the discal cell; the ultimate section of fourth vein is strongly sinuate. *Abdomen*: Sides almost straight, slightly widest at about segment three; first tergum entirely cinereous, lateral brushes each composed of three to four strong black bristles on lateral margins and a few weak pale hairs toward the dorsal portion; other terga brownish pruinose on anterior three fourths, cinereous on posterior margins and on the sides; the cinereous bands are partially interrupted medianly by brownish pollen. *Hypopygium*: Symmetrical, the eighth segment without depressed areas, seventh sclerite scarcely visible from dorsal view (fig. 45b). From lateral view the sixth sclerite is very small but the seventh is quite well developed (fig. 45f). From ventral view the ninth segment is much longer than wide and twice as long as the length of the eighth; the cleft on hind margin is comparatively small and 'U' shaped (fig. 45g). Harpagones very irregular, the inner one is long, slender, greatly curved and flattened at apex (fig. 45c); the outer harpagone is very small, the lateral margins are produced into obtuse lobes.

Length: body, 4.3-4.6 mm.; wing, 4.8-5.3 mm.

Female. Eyes narrowly separated on front, about as wide as width of median ocellus; apical halves of abdominal terga two to five cinereous, narrowly interrupted with brown medianly; sixth terga largely cinereous with a very thin median brown stripe. Ovipositor as described above, piercer shorter than its large irregular base (fig. 45d); otherwise like the male.

Holotype ♂: Sunnyside Canyon, Huachuca Mts., Arizona, July 9, 1940 (D. E. Hardy). Allotype ♀, same locality and date (R. H. Beamer). Paratypes: twenty-six ♂♂, fifteen ♀♀ from following localities: same as type (R. H. Beamer, D. E. Hardy), also July 18,

1938 (D. W. Craik); Chiricahua Mts., Arizona, July 9, 1940 (R. H. Beamer, D. E. Hardy); Glasco, Kansas, Aug. 24, 1940 (R. H. Beamer). All in the Snow Entomological Collection.

Dorilas (Eudorylas) kansensis Hardy

(Plate 7, figs. 46a-b)

Dorylas kansensis Hardy, 1940, Journ. Kans. Ento. Soc. 13, 102-103.

Following is the original description:

"The species differs from *affinis* in being more melanistic; having the third antennal segment shorter, subacuminate below; thorax and abdomen subshining, lightly dusted with gray, abdominal segments without distinct cinereous vittae, fifth segment scarcely longer than the fourth; third section of the costa is slightly shorter than the fourth and ultimate section of fourth vein (M_{1+2}) strongly sinuate (fig. 46a). The upper one-half of the front in the female is shining black and the ovipositor is slightly longer than in *affinis*, extending to the base of the third abdominal segment.

"The male genitalia of *affinis* and *kansensis* are nearly identical from dorsal view, being symmetrical without marked depression apically. The hypopygium is more nearly equal the length of the fifth abdominal tergum in *kansensis*, due to the shortness of that sclerite. From a ventral view the genitalia is very distinctive, the ninth segment is about as wide as long with a deep U-shaped cleft in middle on apical margin, the cleft extends about three-fourths the length of the segment on a median line. The harpagones are broad, bluntly pointed, strongly sclerotized and dark in color; the inner clasper is the wider and very slightly longer than the outer (fig. 46b). The membranous portion is on the apex of the eighth on the right. The seventh sclerite is about the same width as the base of the inner clasper; the sixth segment is reduced to a narrow strip and curves under the clasper giving support to the wall of the genital chamber.

"Length male: body, 3.6-3.8 mm.; wings, 4-4.1 mm.

"Length female: body, 3.5 mm.; wings, 4 mm."

Type locality: Douglas County, Kansas.

Type in Snow Entomological Collection.

Added distribution:

Arizona: Grand Canyon, July 11, 1927 (R. H. Beamer).

British Columbia: Trinity Valley, July 23, 1937 (K. Graham).

Colorado: Wray, Aug. 25, 1940 (L. C. Kuitert); Pingree Park, Aug. 13, 1934 (C. W. Sabrosky); Maybell, Aug. 18, 1940 (R. H. Beamer).

Iowa: 5 mi. E. Renwick, Aug. 9, 1938 (G. O. Hendrickson).

Kansas: Manhattan, May 21, 1931 (R. H. Beamer); Leon, June 20, 1940 (L. C. Kuitert); Garnett, Aug. 31, 1940 (R. H. Beamer); Walnut, Aug. 31, 1940 (R. H. Beamer).

New Mexico: Ruidoso, June 26, 1940 (D. E. Hardy).

Dorilas (Eudorylas) lasiofemoratus (Hardy-Knowlton)

(Plate 7, figs. 47a-c)

Pipunculus lasiofemoratus Hardy-Knowlton, 1939, Ann. Ento. Soc. Amer. XXXII, 116-117.

Species related to *nigripes* but distinguished by wing venation and genital characters.

Following is the original description with additional notes on the wing venation:

"*Male*. Eyes joined; face and front silvery, vertex and upper occiput shining black, lower portion of occiput gray. Second segment of antennae black with bristles above and below, third segment acute (fig. 47a) tinged with brown but lightly whitish pubescent. Mesonotum and scutellum opaque brownish black, the margins slightly grayed. Pleurae, coxae, humeri and metanotum cinereous; humeri black in ground color. Scutellum sparsely bristled on posterior margin. Knobs of halteres black, stems brownish. Trochanters, femora and tibiae chiefly black with cinereous pollen, their apices, bases of tibiae and of hind femora yellow; the inner edge of the posterior femora brownish and shining. Tarsal segments one to four yellow, fifth brownish; tarsal claws and pulvilli yellow, the claws with black tips. Apical three fifths of anterior femora with two rows of spines extending almost to bases. All femora with a row of long bristles toward the dorsal edge on each side. Posterior femora with dense long curved hairs below and a row of long hairs dorsally on the inner side. All tibiae with numerous rows of short spines having short black hairs intermixed and a dense brush of short yellow hairs beneath anteriorly. Pile of tarsi chiefly black above, yellow beneath, posterior tibiae and femora arcuate.

"First segment of abdomen silvery gray, pollinose on sides and along anterior margin, narrowly interrupted with brown in the center. Segments two to five finely gray pollinose on the sides and anterior margins with broad interruptions in the middle; abdomen otherwise shining black with a slight brownish tinge. Lateral comb of first abdominal segment composed of long black hairs. Abdomen with hypopygium small, slightly exceeding one half length of the fifth segment of the abdomen; apically cleft and with a slight keel (fig. 47c), also a smaller cleft basally just to the right of center."

Wings faintly iridescent, third section of costa shorter than the fourth, stigma little over one half the length of the fourth section; fifth costal section shorter than the third and fourth combined (fig. 47b). Crossvein r-m situated beyond the end of subcostal vein and at about middle of discal cell; ultimate section of fifth vein strongly sinuate.

Length: body, 3.8 mm.; wings, 4.3 mm.

Female unknown.

Type locality, Nibley, Utah.

Type in United States National Museum.

Dorilas (Eudorylas) latipennis (Banks)

(Plate 8, figs. 48a-c)

Pipunculus latipennis Banks, 1915, *Psyche*, 22, 168.

The very broad wings of this species distinguish it from all other known *Dorilas*.

Female. Antennae yellow, third segment long acuminate (fig. 48a); face and front silvery. Humeri and halteres yellow, knobs of halteres slightly darker than stems; propleurae bare. Legs yellow with only faint discolorations on femora; all femora slender, spines weak. *Wings*: Extremely broad and rounding apically, third section of costa about one half the length of the fourth; apical cell wider at wing apex than length of the r-m crossvein; crossvein r-m situated at basal one fourth of the discal cell; ultimate section of the fourth vein about three times the length of the posterior crossvein and almost straight (fig. 48b). *Abdomen*: Polished, lateral margins and entire first segment gray. Ovipositor short, piercer about equal to its short globose base (fig. 48c).

Length: body, 2.6 mm.; wing, 3 mm.

Male unknown.

Type locality: Falls Church, Virginia.

Type in Cambridge Museum of Comparative Zoölogy.

This species is known only from the type female.

Dorilas (Eudorylas) lautus n. sp.

(Plate 8, figs. 49a-e)

This species is related to *subopacus industrius* (Knab) but is distinguished by having the hypopygium twice as long as fifth abdominal segment, the large tuberculate ninth segment, the comparatively small eighth and the strongly curved harpagones; specimens are also of larger size.

Male. Moderately sized, opaque, chiefly bare species. *Head*: Eyes joined on upper two thirds of front, frontal triangle and face silvery pubescent; antennae black, bristles of second segment short; third segment acuminate (fig. 49a); mouthparts yellowish, palpi with brown. *Thorax*: Mesonotum and scutellum densely brownish pruinose, grayed on the sides; pleurae and metanotum cinereous, metanotum evenly convex without an indication of a transverse furrow; humeri yellow, knobs of halteres black; dorsocentral and marginal hairs very weak, propleurae bare. *Legs*: Chiefly black except for yellow apices of femora and tibiae, broad bases of tibiae

and first three tarsal subsegments; front and middle with rather strong apical bristles on the venter. *Wings*: Third costal section about equal to fourth, fifth section much shorter than third and fourth combined; stigma dark brown in color, completely filling third costal section; crossvein r-m situated at about end of subcostal vein and at about basal one third of discal cell; ultimate section of fourth vein slightly sinuate. *Abdomen*: Broad and short, chiefly opaque brown, faintly grayed on posterior margins of the segments, distinctly so on the sides; sides of abdomen straight, segments comparatively short. *Hypopygium*: Very large, symmetrical and rounding, twice as long as fifth abdominal segment and longer than the fourth and fifth segments combined (fig. 49e). The sixth segment is scarcely visible from dorsal view; the seventh segment is distinct. From ventral view the ninth segment is strongly developed, equal or larger than the comparatively small eighth segment; ninth segment distinctly tuberculate on outside margin, apical cleft shallow and 'U' shaped. Harpagones strongly curved inward, produced somewhat bootlike at their apices (fig. 49d). Cerci rather small, not obscuring the bases of harpagones.

Length: body 3.5-3.7 mm.; wing, 4 mm.

Female. Runs in the *kansensis-affinis* group but is readily distinguished by the unusual development of the ovipositor base. Front broad, chiefly silvery, with a median ridge of black extending about one third its length from ocellar triangle. Third antennal segment longer acuminate than in the male. The abdomen is slightly clavate from lateral view due to the expansion of the fifth and sixth segments. Ovipositor base about equal to size of sixth segment (fig. 49b) from lateral view and somewhat compressed dorso-ventrally (fig. 49c), a distinct line of articulation is present between piercer and base. Piercer, from line of articulation, about equal to base. The fifth and sixth terga extend to the venter and form a groove into which the ovipositor fits when in resting position.

Holotype ♂: Tajique, New Mexico, VI-25-40 (R. H. Beamer); allotype ♀, same locality and date (D. E. Hardy). Paratypes: two ♂♂, one ♀, same locality and date (R. H. Beamer, D. E. Hardy); one ♂, Cloudcroft, New Mexico and one ♂, one ♀, Ruidoso, New Mexico, June 26, 1940 (R. H. Beamer, D. E. Hardy). All in the Snow Entomological Collection.

Dorilas (Eudorylas) loewii (Kertész)

(Plate 8, figs. 50a-e)

Pipunculus loewii Kertész, 1900, Wiener Ent. Zeitung, XIX, 244. Change of name.*Pipunculus fasciatus* Loew (nec. v. Ross), 1872, Centuria X. Ber. Ent. Zeit, XVI, 88.*Pipunculus semifasciatus* Cresson, 1911, Trans. Amer. Ent. Soc. XXXVI, 288-289. New synonymy based upon comparison of the types.*Pipunculus nigricornis* Adams, 1903, Kans. Univ. Sci. Bull. II, No. 2, 36. New synonymy based upon study of type.

D. fasciatus has been unidentifiable from the description. Cresson keys it in the group with a non-cleft hypopygium. Examination of the type, No. 451, in the Cambridge Museum proved that it belongs in an entirely different group.

Male. Head: Upper occiput and vertex shining black, sides of occiput, front and face cinereous to silvery pubescent; occiput rather narrow; antennae dark brownish to black, third segment acute (fig. 50c). *Thorax:* Mesonotum and scutellum subopaque, finely brown dusted; pleurae and metanotum grayish pollinose; humeri brown, knobs of halteres black, stems yellowish, propleurae bare; coxae and trochanters brown, femora chiefly black with apices and sometimes bases yellow; tibiae discolored with brown in the middles, otherwise yellow; last tarsal subsegments brown; femora moderately thickened, spines well developed; posterior tibiae arcuate. *Wings:* faintly infuscated and iridescent, third costal section about as long as fourth, stigma pale brownish and almost filling the third costal section; fifth section of costa shorter than third and fourth combined; ultimate section of fourth vein (M_{1+2}) strongly sinuate; radio-medial crossvein situated at about the basal one third of the discal cell; last section of fifth vein about equal in length to posterior crossvein; petiole of cubital cell comparatively long (fig. 50d). *Abdomen:* Opaque brownish to black at the base of each segment, distinctly cinereous on their posterior portions, these facia are broadly interrupted with brown on segments two and three, faintly so on segment four and continuous on segments one and five. Abdomen short, rather rounding on the sides, widest at segments two to three. *Hypopygium:* About three fourths as long as fifth segment, with a large apical cleft and a distinct terminal appendage-like keel (fig. 50e); this appendage is not plainly visible from a direct dorsal view, unless extended. From ventral view the membranous portion of the eighth covers most of that segment. The ninth segment is about as broad as long with a shallow, broadly 'V' shaped cleft on hind margin. Harpagones long, rather slender and rounding apically (fig. 50b); cerci small.

Length: body, 4.2 mm.; wing, 5 mm.

Female. Front shining black on upper one half, lower portion silvery pubescent; raised in the center on upper part with a ridge of shining black extending down into the silvery portion; widest at about middle and slightly narrowed toward the antennae and the vertex. The abdominal segments are not so distinctly fasciated and are subopaque to faintly shining. The ovipositor is very long and slender, reaching beyond base of abdomen (fig. 50a).

Type locality: Belfrage, Texas.

The writer has studied the type in Cambridge Museum and has specimens from the following states: Arizona, Kansas, Massachusetts, Minnesota, Missouri, New Hampshire, New Mexico, New York, North Carolina, South Dakota, and Virginia.

Dorilas (Dorilas) luteicornis (Cresson)

(Plate 8, figs. 51a-c)

Pipunculus luteicornis Cresson, 1911, Trans. Amer. Ent. Soc. XXXVI, 307.

This is very close to *fuscus* (Loew) and *ater* (Meigen) and may eventually prove to be a subspecies of one of these. It can be separated by the yellow antennae, humeri and bases of femora, but structurally it is not a distinct species.

Female. Head: Third antennal segment acute (fig. 51a), bright yellow to slightly brownish; face and front silvery; front slightly wider at one third to one half the distance from vertex to antennae; mouthparts faintly yellowed. *Thorax:* Subshining in ground color, faintly to rather densely dusted with brown to gray pollen on the dorsum, scutellum mostly shining; pleurae, metanotum, first abdominal segment and lateral margins of segments two to five cinereous; humeri and halteres yellow, propleurae each with a small brush of long yellow hairs; dorsum of thorax and abdomen rather sparsely covered with short pale pile; legs chiefly yellowish, all femora with very broad brown to black rings, coxae black, trochanters discolored; femora moderately thickened, femoral spines distinct on apical one third. *Wings:* Hyaline, faintly iridescent. Stigma completely filling third costal section; third section equal to fourth in length; third and fourth together almost equal to fifth section of costa; crossvein r-m situated at about the end of the subcostal vein and at basal one fourth of discal cell; ultimate section of fourth vein (M_{1+2}) sinuate; last section of fifth vein (Cu_1) about equal in length to the posterior crossvein (fig. 51b). *Abdomen:* Chiefly polished with only first segment and lateral margins of two to five cinereous; sixth segment entirely polished; ovipositor shining, base somewhat globose, brown

to black; piercer yellowish, but slightly longer than the base (fig. 51c).

Length: body, 3.8 mm.; wing, 3.8 mm.

Male unknown.

The association of the male will clear up any doubt as to the position of this species.

Type locality: Machias, Maine.

Type at Boston Society of Natural History.

The writer has examined the holotype, also a homotype from Hampton, New Hampshire, June 24, 1910 (S. A. Shaw). Specimens from Quinault, Washington, 7-26-31 (R. H. Beamer); Mt. Washington, N. H. (Mrs. Slosson) and Cold Springs Harbor, Long Island, July 25, 1932 (Curran) compared in all respects with the type.

Dorilas (Eudorylas) minor (Cresson)

(Plate 8, figs. 52a-f)

Pipunculus minor Cresson, 1911, Trans. Am. Ent. Soc. XXXVI, 293-294.

This is a rather widely distributed and well distinguished species.

Male. Head: Front and face silvery pubescent, eyes joined on the front for about the length of the frontal triangle; occiput cinereous, mouthparts yellowish; third segment of antennae long acuminate (fig. 52a), bright yellow to faintly brownish in color; base of arista slightly yellowish. *Thorax:* Mesonotum subopaque brown dusted, grayed on the sides; metanotum and pleurae cinereous; scutellum subshining, only faintly dusted; humeri and halteres yellow, propleurae bare. Thorax and abdomen almost devoid of pile; legs almost entirely yellow, coxae blackish, femora usually with narrow discolorations of brown, last tarsal subsegment brown; femora slender, spines weak; hind tibiae slightly bowed. *Wings:* Faintly iridescent, third section of costa longer than fourth, stigma completely filling the third section; fifth costal section about equal to the third and fourth combined; crossvein r-m situated at the basal one third of discal cell, ultimate section of fourth vein straight (fig. 52b). *Abdomen:* Subopaque to faintly shining in ground color, densely brownish pollinose; apical margin of first segment and lateral angles of following segments grayish. Sides of abdomen almost straight, fifth segment twice as long as the fourth. *Hypopygium:* Rather small, little over one half the length of the fifth segment; with a very distinct apical cleft (fig. 52e). Ninth segment and harpagones yellowish; harpagones symmetrical, rather slender and bluntly pointed (fig. 52f). From a lateral view the twisting of the post-abdominal segments is clearly seen. Segments six to nine have

become twisted around to the right; six occupies an almost ventral position, segment seven has been pulled to the right and turned under and is covered above by the fifth tergum.

Length: body, 3-3.5 mm.; wings, 3.8-4 mm.

Female. Front chiefly cinereous with a narrow line of shining black extending about half way down middle from ocellar triangle. Abdomen usually subshining only faintly grayed on the margins, in some specimens the apices of the segments are distinctly gray vitate. Ovipositor yellowish, piercer short, about equal to base in length, base of ovipositor broad and rounding (fig. 52c).

Type locality: North Haven, Connecticut.

Type at Boston Society of Natural History.

The writer has examined the type series, also specimens from the following areas, this covers the known distribution of the species: Arizona, California, Connecticut, Kansas, Maryland, Massachusetts, Maine, Michigan, New Hampshire, New Mexico, New York, North Carolina, Ohio, Oklahoma, Pennsylvania, South Dakota, Texas, Utah, Vermont, Virginia, Washington, also Quebec, Ontario and México.

Dorilas minor cressoni (Johnson)

Pipunculus cressoni Johnson, 1919, Bull. Amer. Mus. 41, 433. New combination.

By examination of the type male, *cressoni* Johnson, at the Boston Society of Natural History, appears to be a subspecies of *minor* Cresson, differing from the typical form in having the hypopygium, sides and venter of abdomen yellow, no specific differences were observed.

This subspecies is southern in distribution, apparently ranging through southern United States on down into the tropics.

Jamaica is the type locality of *cressoni*; the writer has a homotypic series from Adel, Georgia, 8-11-39 (R. H. Beamer); Griffin, Georgia, 8-12-39 (R. H. Beamer, D. E. Hardy).

These specimens were all taken sweeping in *Arundinaria* (wild cane) and were associated with leafhoppers of the genus *Arundanus* and the Fulgoridae, *Stenocranus arundineus* Metcalf. Whether they parasitize both of these is not known but there is apparently some degree of host specificity.

Dorilas (Eudorylas) montivagus n. sp.

(Plate 8, figs. 53a-e)

This species is related to *tarsalis* (Banks) but is readily distinguished by the shorter third costal section and minute stigma; the eyes of the male are narrowly separated on the front, the hypopyg-

ium has a distinct depressed area at apex and the eighth segment is not over half the length of the fifth from dorsal view.

Male. Almost entirely bare, chiefly shining black species. *Head:* Eyes narrowly separated on the front, face and lower one third of front silvery pubescent, upper two thirds of front shining black; lower portion slightly convex; bristles of second antennal segment weak; third segment yellow, long acuminate below (fig. 53a); mouthparts bright yellow. *Thorax:* Subshining black, faintly brownish pruinose on the dorsum, grayish on pleurae and metanotum; metanotum evenly convex, with no indication of a transverse furrow; humeri and halteres bright yellow. Dorsocentral and marginal hairs weak, propleurae bare. *Legs:* Coxae, broad apices and narrow bases of femora black, legs otherwise yellow; flexor spines of femora very weak, no prominent apical bristles on tibiae. *Wings:* Third costal section one half to one third the length of the fourth, fifth section more than one and one half times the length of third and fourth combined; stigma occupying just the apex of third section; crossvein r-m situated at about middle of third costal section and at about basal one fourth of discal cell; ultimate section of fourth vein strongly curved, last section of fifth shorter than the length of posterior crossvein (fig. 53b). *Abdomen:* Polished black, lateral margins of segments two and three sometimes faintly yellowish in ground color; sides of abdomen straight. *Hypopygium:* Symmetrical, rather evenly rounding, with a distinct apical membranous area slightly to the right side; seventh sclerite scarcely visible from dorsal view (fig. 53d); from ventral view the ninth segment is about as broad as long, with a rather shallow 'U' shaped cleft on hind margin; harpagones asymmetrical, the outer being twice as broad as the inner; the inner harpagone is slender and somewhat curved inward at apex while the outer is broad, flattened laterally and concave on inner margin (fig. 53e); cerci rather small.

Length: body, 3.8-4 mm.; wings, 4.3-4.6 mm.

Female: Front broad, as wide as the ocellar triangle, shining black on upper one half, silvery below. Sides of segments three and four yellowish on posterior margins, most of the venter yellowish in ground color. Base of ovipositor subglobose with a small tubercle near apex, below. Piercer short and thick, gradually tapering from its base (fig. 53e), about equal to base in length.

Holotype ♂: Cameron Pass, Colorado, Aug. 20, 1940 (G. F. Knowlton). Allotype ♀ same data, one paratype ♂ same locality as type, Aug. 19-22, 1940 (C. W. Sabrosky), one paratype ♂ Pin-gree Park, Colo., Alt. 9200 ft., VIII-14-1934 (C. W. Sabrosky).

Holotype and allotype returned to G. F. Knowlton, Utah State Agricultural College. One paratype returned to C. W. Sabrosky, Michigan State College, and one retained in the Snow Entomological Collection.

Dorilas (Eudorylas) nevadaensis n. sp.

(Plate 9, figs. 54a-f)

This species is related to *stigmaticus brachystigmaticus* (Hardy-Knowlton) but is readily separated by the wing and genital characters. The wings are narrow, not broad and rounding as in *stigmaticus*; vein R_{1+2} lies close to the subcostal vein so that the subcostal cell is much more narrow than in *stigmaticus*; apical cell greatly attenuated at wing apex, instead of broad and widely open. The base of the ovipositor is more elongated and the piercer is short and rather thick, but little longer than its base instead of twice as long as in the related species and curved instead of straight, the front of the female is not so shining and is somewhat carinated above antennae. The ninth segment of the male is larger, broad and swollen, being about as large as the eighth segment, extending farther toward the apex on the left side. The cleft of the ninth is narrowly 'U' shaped, not so broad and deep (compared to length of the segment), extending about one third its length instead of about half as in *stigmaticus*. The harpagones are black instead of yellow, bare instead of haired, and are acutely pointed apically. The cerci are smaller more anterior in location, scarcely extending past apices of ninth segment (fig. 54f). It is a more opaque species.

Male. Head: Antennae black, third segment acuminate, with a dense fringe of pale pile above; eyes joined for two thirds the length of the front; front slightly gibbose, subshining black in ground color, densely covered with silvery pubescence; mouthparts brownish to black, tip of labellum slightly yellowish. *Thorax* (and abdomen) subopaque, the shining ground color being obscured by brownish pollen; humeri black, propleurae bare; halteres brownish to black; legs almost entirely black, only extreme apices of femora and tibiae, broad bases of tibiae and first tarsal subsegments yellow; rest of tarsi brownish to black; femoral spines very weak. *Wings:* Lightly iridescent, long and narrow; third costal section short, about one-third to one half the length of the fourth, the stigma rather obscure because of the thinness of the subcostal cell and occupying apical portion; crossvein r-m located beyond the end of subcostal vein and before basal one third of the discal cell; ultimate section of fourth vein sinuate. Abdomen with sides slightly rounding, widest at seg-

ments two to three. *Hypopygium*: Symmetrical, broadly rounding, slightly shorter than eighth segment from dorsal view; from this view the seventh sclerite is plainly visible on the right side and the large ninth segment on the left side (fig. 54d). From lateral view the ninth segment is large and somewhat swollen, being almost as large as the eighth segment (fig. 54e). From ventral view the ninth segment extends over half the length of the eighth and its entire length is about equal to the length of that segment. The ninth is very broad, square tipped at its apices and the cleft is narrowly 'U' shaped, extending about one third its length on a middle line. Harpagones broad at bases gradually tapering into acute points at apices. Cerci small, not reaching much beyond bases of harpagones (fig. 54f).

Length: body, 3.3-3.6 mm.; wing, 3.7-4.1 mm.

Female. Front with a slightly elevated shining black area extending from ocelli about two thirds its length into the opaque area; lower one third and narrow extensions along eye margins silvery pubescent. Ovipositor short, base rather elongate, not at all globose; piercer thick and somewhat curved downward (in extended position), scarcely longer than base (fig. 54b). Otherwise like the male.

Holotype ♂: Fallon, Nevada, August 12, 1940 (D. E. Hardy). Allotype ♀ and nineteen paratypes, fourteen ♂♂ and five ♀♀, same locality and date as type (R. H. Beamer, E. E. Kenaga, D. E. Hardy). All in Snow Entomological Collection.

Dorilas (Eudorylas) nigripes (Loew)

(Plate 9, figs. 55a-d)

Pipunculus nigripes Loew, 1865, Centuria VI. Ber. Ento. Zeitse., IX, 176.

Pipunculus dubius Cresson, 1911, Trans. Amer. Ento. Soc. V. XXXVI, 284. New synonymy.

Pipunculus winnemannaë Malloch, 1913, Proc. U. S. Nat. Mus. 43, 655-656. New synonymy. based upon study of types.

The type male of *dubius* Cresson was compared with that of *nigripes* Loew in the Cambridge Museum of Comparative Zoölogy and found to be synonymous. The species which has been recognized as *nigripes* Loew is certainly not this. At present it does not appear to fit any described species and may be new. In this particular group of DORILAIIDAE life history studies would be especially valuable.

This species is near *stigmaticus* (Malloch) but is easily separated by its more elongate stigma and third costal section of the wing.

Male. Small, bare and almost entirely black species. *Head*: Front and face silvery, median portion of front with a narrow vertical line of opaque black; eyes joined for about the length of the frontal triangle; vertex and ocellar triangle shining black, occiput

brownish pollinose above, gray on the sides and lower portion; antennae black, third segment short acuminate, bristles of second segment weak (fig. 55a). *Thorax*: Mesonotum brownish pollinose, subshining in ground color; pleurae and metanotum lightly grayed; propleurae bare; humeri brown to black; knobs of halteres brown, stems pale; legs almost entirely black, extreme apices of femora and bases and apices of tibiae usually yellowish; tarsi brownish, tinged with yellow; femora slender, spines very weak, scarcely discernible; tibiae almost straight; posterior basitarsi longer than the next three sections of tarsi. *Wings*: Faintly iridescent; third section of costa longer than the fourth, stigma not quite filling third section; fifth costal section equal to the third and fourth in length; crossvein r-m situated just beyond the end of the subcostal vein and at the basal one third to one fourth of the discal cell; ultimate section of fourth vein almost straight, very slightly curved (fig. 55d). *Abdomen*: Opaque brownish pollinose; short, scarcely longer than the thorax and somewhat rounding on the sides. First tergum and lateral margins of other segments grayish, apices of segments more subshining, bases entirely opaque; fifth segment subshining, lightly dusted on apical half, hypopygium entirely so. *Hypopygium*: Small, symmetrical with no distinct cleft but with a faint depressed area at apex on right side (fig. 55b). Ninth segment and harpagones blackish.

Length: body, 2.3-2.5 mm.; wings, 3.3-3.8 mm.

Female. Eyes widely separated, front wider in middle than just above antennae; upper two thirds to three fourths of front polished black, lower portion, just above antennae silvery. Abdomen more grayish, segments more entirely opaque; sixth segment entirely cinereous. Ovipositor brownish, tinged with rufescent toward piercer; base subglobose with a slight development anteriorly, on under side; piercer plainly articulated and slightly longer than its base, rather slender, reaching to about the apex of the first segment (fig. 55c).

Type locality: Pennsylvania.

The writer has examined Loew's type in Cambridge Museum of Comparative Zoölogy; also the type series of *dubius* Cresson at the Boston Society of Natural History and has homotypic specimens from: Cappens, Maine, July 20; Huntsville, Utah, Aug. 25, 1938 (G. F. Knowlton, D. E. Hardy); and Logan Canyon, Utah, Aug. 7, 1938 (D. E. Hardy, A. T. Hardy). Specimens have also been examined from numerous localities in the following states: California, Connecticut, Georgia, Idaho, Kansas, Maine, Maryland,

Massachusetts, Minnesota, New Jersey, New York, North Carolina, Pennsylvania, Rhode Island, Tennessee, Texas, Utah, Vermont, and Virginia.

Dorilas (Dorilas) pallipes (Johnson)

(Plate 9, figs. 56a-f)

Pipunculus pallipes Johnson, 1903, Ent. News, XIV, 107.

Pipunculus houghii Cresson (nec Kertész), 1911, Trans. Amer. Ent. Soc. XXXVI, 308.

This species is easily recognized by its slender yellow legs, yellow humeri and polished black abdomen.

Male. Almost entirely bare species. *Head:* Front and face silvery, mouthparts and third antennal segment bright yellow; basal two sections of artista yellow, first two sections of antennae yellow-brown to yellow; occiput chiefly cinereous more lightly grayed above, compound eyes joined on upper portion of the front for about the same distance as the length of the frontal triangle; third antennal segment acute, rather small, scarcely twice as large as second segment and densely white pubescent (fig. 56a). *Thorax:* Mesonotum and scutellum polished in ground color, very faintly dusted with brownish pollen; metanotum and pleurae lightly cinereous, the latter sometimes with a tinge of yellow in the ground color. Humeri and halteres bright yellow, propleurae with a brush of long yellow hairs on the hind margins; legs entirely yellow the coxae and apices of tarsi somewhat brownish; femora slender, femoral bristles distinct on apical portions below; hind tibiae slightly arcuate. *Wings:* Lightly iridescent; third section of costa twice as long as the fourth, stigma completely filling the third section; fifth costal section about equal in length to the third and fourth combined; crossvein r-m situated before the end of the subcostal vein and at about basal one fourth of the discal cell; ultimate section of fourth vein almost straight, with but a slight curvature; this section is about equal in length to the third section (that part of media from r-m crossvein to the m); last section of fifth vein much shorter than the length of the posterior crossvein (m) (fig. 56b). *Abdomen:* Subcylindrical, sides almost straight; usually shining black in ground color, venter and sometimes lateral margins yellowish; the first tergum is grayish dusted, the other terga are faintly dusted with gray on the sides and sometimes very lightly pollinose above. *Hypopygium:* Rather small, scarcely over half the length of the fifth segment; asymmetrical, slightly compressed to the right with a large apical cleft toward the right side (fig. 56e); this cleft possesses a small inconspicuous development in the mid-

dle, formed by a folding in the membrane; ninth segment and harpagones yellowish, harpagones slightly asymmetrical, from ventral view the clasper on the left is longer and more curved. The sixth and seventh abdominal sclerites are ventral in position and on the right side; from ventral view the anterior lateral margin of the sixth extends as a long slender projection beneath the harpagones giving support to the membranous genital cavity (fig. 56f). Upon relaxation of the posterior part of the abdomen the depressed area of the hypopygium is expanded and seen to consist of a membranous apical portion.

Length: body, 4.4-5.9 mm.; wings, 5.6-6.3 mm.

Female. Front chiefly silvery, shining at vertex, strongly narrowed just before ocellar triangle. Ovipositor short, base globose, slightly longer than fifth segment; piercer very stout and tapering, about three fourths as long as its base (fig. 56c), apical portion of base with a slight tubercle below. Thorax and abdomen with a yellow-brown tinge. Otherwise like male.

Type locality: Wildwood, New Jersey.

The writer has examined the type at the Boston Society of Natural History and a large series of homotypes. The species has been identified from numerous localities in the following states and Canadian provinces: Alberta, British Columbia, Connecticut, Georgia, Kansas, Maine, Massachusetts, Michigan, Nebraska, New Hampshire, New Mexico, New York, Ohio, Ontario, Quebec, Pennsylvania, Rhode Island, South Dakota, Utah, Virginia and Wyoming.

Dorilas (Eudorylas) reipublicae (Walker)

(Plate 9, figs. 57a-e)

Pipunculus reipublicae Walker, 1849, List of Dipt. Ins. in British Mus., III, 639.

Pipunculus albofasciatus Hough, 1899, Proc. Bost. Soc. Nat. Hist. XXIX, 85 (*albofasciata*).

This synonymy was established by Cresson²⁵ and based upon notes and figure of the type of *reipublicae* which were made by Banks. He discounts Malloch's suggestion that this may be the same as *atramontensis* Banks²⁶ on the basis that the abdomen of the Walker type is broad and the hypopygium large, indicating *albofasciatus* Hough, rather than Bank's species. This writer has not seen the type of *reipublicae* so is unable to confirm or deny this synonymy.

This is a very well defined species, easily recognized by its small stigma, the broad cinereous band on fifth abdominal tergum and

25. 1912, Ent. News, XXIII, 455-456.

26. 1912, Proc. U. S. Nat. Mus. XLIII, 291.

large rather symmetrical hypopygium, with a distinct depression on the left side near apex. The species recognized as *loewii* Kertész by Banks²⁷ is apparently *reipublicae* (Walker).

Dorilas reipublicae is an intermediate species between *Dorilas* and *Tömösváryella* although no specimens have been seen which are without a stigma in the wing.

Male. Head: Front silvery to golden pubescent, face silvery; vertex shining, occiput dull black on upper portion, gray pollinose below; compound eyes joined for about one third the distance of the front, narrowly separated above; antennae black, third segment long acuminate (fig. 57a). Mesonotum brownish pollinose, margins gray; pleurae and metanotum cinereous; propleurae bare; humeri and stems of halteres yellow, knobs of halteres yellow-brown to black; legs chiefly black, apices of femora yellow, tibiae discolored with brown to black medianly; first four tarsal subsegments yellow, last subsegment brown; femora slender, spines weak; posterior tibiae only slightly bowed. *Wings:* Iridescent tinged; third section of costa little over one half the length of the fourth, stigma only occupying apical portion of third section; fifth costal section shorter than third and fourth together; crossvein r-m situated beyond the end of the subcostal vein and just before the middle of the discal cell; last section of fourth vein (M_{1+2}) sinuate (fig. 57b). *Abdomen:* Broad, subshining to opaque, sides nearly straight; first segment entirely cinereous, segments two to four brownish pollinose, gray on the sides; fifth with a broad cinereous band across the segment, only a narrow basal portion brownish; fifth segment one and one fourth times as long as fourth and with a small indentation on each side dorsomedianly. *Hypopygium:* Large and rather symmetrical, more shining than abdomen, only lightly dusted; equal to or longer than the fifth segment and with a distinct depression or cleft on the left side (fig. 57e); sometimes a small carina visible, arising from the cleft; ninth segment and harpagones yellowish, the latter symmetrical and broadly rounding apically; aedeagus bifid at its apex (fig. 57d).

Length: body, 3.8-4.2 mm.; wings, 4.3-5 mm.

Female. Front chiefly shining black, only silvery just above antennae. Fifth abdominal segment with two cinereous spots laterally, these are narrowly interrupted medianly; segment not so completely cinereous as in male. Sixth segment almost entirely cinereous, with extreme base and an indistinct longitudinal median line brownish.

27. 1915, *Psyche*, 22, 166.

Piereer of ovipositor about equal to and rather abruptly terminating its large base; base slightly tuberculate below (fig. 57e). Cresson describes and figures the female wing as being without a stigma. The specimens the writer has examined have the small stigma as in the male.

The females are rare in proportion to the males.

Type locality: New York.

Type in British Museum.

The writer has studied Hough's type of *albofasciatus* from Opelousas, Louisiana in the Field Museum at Chicago.

The species is widely distributed, the writer has examined specimens from the following states and Canadian provinces: Alberta, Connecticut, Florida, Georgia, Iowa, Kansas, Kentucky, Maine, Massachusetts, Michigan, Minnesota, New Jersey, New York, North Carolina, Ohio, Ontario, Oklahoma, Pennsylvania, Rhode Island, Saskatchewan, Tennessee, Virginia, and Vermont.

Dorilas (Eudorylas) sabroskyi n. sp.

(Plate 9, figs. 58a-f)

This species is related to *affinis* (Cresson) but is characterized by the broad rounding harpagones of the males and by the flattened, distinctly articulated piercer and shorter more oval, opaque yellowish ovipositor base of females; specimens are of smaller size, the third costal section of the wing is much longer than fourth, the legs chiefly black and the front of the female is almost entirely shining.

Male. Small chiefly bare species. *Head:* Eyes contiguous for about length of frontal triangle, frontal triangle chiefly silvery pubescent, verging into opaque black on upper portion; antennae black, third segment acuminate and scarcely wider than the second (fig. 58a); bristles of second antennal segment weak. *Thorax:* Subshining in ground color, brownish pruinose on the dorsum, gray on the pleurae and metanotum; metanotum evenly convex, without indication of a transverse furrow; dorsocentral and marginal hairs weak, propleurae bare; humeri brown to black on lower portions, yellow above. Stems of halteres yellow, knobs yellow-brown; legs chiefly black, narrow bases of tibiae and extreme apices of femora yellow; flexor spines of femora very weak, apical bristles of front and middle tibiae moderately developed. *Wings:* Faintly brownish tinged, third section of costa about twice the length of fourth; fifth section almost equal to third and fourth combined (fig. 58b); cross-vein r-m situated just beyond end of subcostal vein and just before basal one third of discal cell; ultimate section of fourth vein straight,

last section of fifth about equal to the length of posterior crossvein. *Abdomen*: Entirely opaque, chiefly brownish pruinose on the dorsum, lightly grayed on apical margins of segments and more cinereous on the sides; sides of abdomen almost straight, fifth segment about one and one half times as long as fourth. *Hypopygium*: Shorter in length than fifth abdominal segment, symmetrical, evenly rounding with no indication of a depressed or membranous area; seventh sclerite well developed, occupying most of the left side of hypopygium (fig. 58e). From ventral view the ninth segment is well developed, somewhat swollen and yellowish in color, longer than wide and about equal to the length of the eighth segment; apical cleft of ninth segment broadly 'V' shaped and moderately shallow. Harpagones enlarged and rounding at their apices (fig. 58f) the outer is slightly longer and bends downward at tip.

Length: body, 2.4-2.6 mm.; wing, 3.3 mm.

Female. Front silvery just above antennae, otherwise polished black; the third costal section appears to be consistently shorter, being about one and one half times as long as fourth and the fifth section is shorter than the third and fourth combined. Base of ovipositor dull yellowish, rather strongly developed, globose above, slightly tuberculate below with a distinct line of articulation separating it from the piercer. Piercer short, about equal in length to base, thickened basally and rather gently tapering (fig. 58c); from dorsal view the piercer is rather strongly flattened (fig. 58d).

Holotype ♂: Isle Royale, Michigan, Aug. 3-7, 1936 (C. Sabrosky). Allotype ♀ and four paratype ♀ ♀ same data as type.

Holotype, allotype and two paratypes returned to Michigan State College, others retained in Snow Entomological Collection.

Dorilas (Eudorylas) stainsi n. sp.

(Plate 10, figs. 59a-c)

This species is related to *caudatus* var. *discolor* but the third antennal segment is very long acuminate, the hypopygium is rounding on the right side, with a depressed area to the left; no membranous area is visible; ninth segment without the marginal indentations and the apical cleft is very shallow; harpagones are short, broad and densely haired, not produced at their apices; wings are also more brownish fumose.

Male. Small, chiefly bare species. *Head*: Eyes joined on the upper two thirds of the front; frontal triangle and face densely silver pubescent, face slightly convex; labellum bright yellow; antennae black, third segment extended into a long slender point (fig. 59a).

Thorax: Faintly brownish pruinose on the dorsum, subshining on the scutellum; pleurae and metanotum gray; metanotum rather evenly convex with but a faint transverse furrow on the upper margin; dorsocentral hairs weak, propleurae bare; humeri black below, yellow on upper portions; halteres yellowish, knobs faintly brown; apices of femora, tibiae, bases of tibiae and first three tarsal sub-segments yellow; legs otherwise black, shining below. Femora slender, flexor spines very weak; hind tibiae slightly arcuate, apical bristles of tibiae moderately developed on front and middle legs; posterior basitarsi almost equal in length to the next four tarsal sub-segments. *Wings:* Brownish iridescent, third costal section slightly shorter in length than the fourth; fifth section about one and one half times as long as fourth; stigma dark brown, occupying about four fifths of the third costal section; crossvein r-m situated just beyond end of subcostal vein and at about basal one fourth of discal cell; ultimate section of fourth vein very slightly curved; last section of fifth slightly longer than posterior crossvein. Wings rather broad. *Abdomen:* Subshining black in ground color, but rather densely covered with grayish to brown pruinosity; sides almost straight, slightly wider at segments three to four. *Hypopygium:* About equal to slightly longer than the fifth abdominal segment, the left side is almost straight while the right is rounding. Seventh segment scarcely visible from dorsal view (fig. 59c). From ventral view no membranous area is visible on the eighth segment; the ninth segment is longer than wide and longer than the eighth, the apical cleft is very broad and shallow. Harpagones are short and broad, rounding at apices and somewhat concave on inner margins. The cerci are large and well developed, extending almost to the apices of the harpagones (fig. 59b).

Length: body, 3-3.4 mm.; wings, 3.7-4 mm.

Female unknown.

Holotype ♂, Brigham Canyon, Utah, July 15, 1940 (G. F. Knowlton, G. S. Stains). One paratype ♂, same data.

Holotype returned to Utah State Agricultural College, the paratype retained in the Snow Entomological Collection.

Dorilas (Eudorylas) stigmaticus (Malloch)

(Plate 10, figs. 60a-d)

Pipunculus stigmatica Malloch, 1913, Proc. U. S. N. M. 43, 294.

Male. Head: Antennae black, third segment acuminate (fig. 60a) but not so elongate below as in *brachystigmaticus* (Hardy-Knowlton); face and front silvery; eyes joined for as long as the length of

the front; occiput cinereous on the sides and below, dull grayish above. *Thorax* (and abdomen) subshining to subopaque with light gray-brown pollen. First abdominal segment grayish. Humeri black, stems of halteres yellow, knobs brown. Legs chiefly black, only apices of femora and bases and apices of tibiae yellow; tarsi yellow-brown, no distinct femoral spines, hind tibiae arcuate. *Wings*: Hyaline, third section of costa but little more than one half the length of the fourth; stigma very dark, filling three fourths of third section (fig. 60b); costa slightly swollen from end of subcostal vein to end of R_{1+2} , crossvein r-m situated at basal one third of discal cell, beyond end of subcostal vein; ultimate section of fourth vein but slightly sinuate, last section of fifth about equal to the posterior crossvein. *Hypopygium*: Symmetrical, about three fourths the length of fifth segment, with a very slight depression on the left side (fig. 60d). Sides of abdomen nearly straight, slightly wider at segments two to four.

Length: body 3.5 mm.; wings, 4.5 mm.

Female. This sex has not been definitely associated as yet but one specimen (from Virginia) is at hand which apparently belongs here. It fits the description of the female of *stigmaticus brachystigmaticus* (Hardy-Knowlton) with the exception that the third section of the costa is less than one half the length of the fourth, the stigma is darker and fills three fourths of third section; the fifth costal section is about equal to the third and fourth combined and the ultimate section of the fifth vein is much longer than the posterior crossvein (fig. 60c).

Type locality: Kaslo, British Columbia.

The writer has studied the type at the United States National Museum, also specimens from Merritt, B. C., Canada, 8-3-1931 (R. H. Beamer); Abbotsford, Quebec, Aug. 30, 1936 (G. Shewell); Cheboygan Co., Michigan, July 20, 1933 (H. Peters). The female specimen described above is from Falls Church, Virginia, Sept. 5 (N. Banks).

Dorilas stigmaticus brachystigmaticus (Hardy-Knowlton)

(Plate 10, figs. 61a-g)

Pipunculus brachystigmaticus Hardy-Knowlton, 1939, Can. Ent. LXXI, 90.

Comparison of specimens of *brachystigmaticus* with the type male of *stigmaticus* proved that the former should probably be considered a subspecies of Malloch's species. It may be distinguished from the typical form by having the wings brownish tinged, costa normal; third section of costa about one third the length of the fourth;

shorter stigma; radio-medial crossvein situated at basal one fifth of discal cell; third segment of antennae longer acuminate and abdomen more shining without gray pollen.

Male. Species almost bare, only pale microscopic pile present on thorax and abdomen. *Head:* Face silvery, front slightly brownish pubescent; vertex shining, occiput opaque black above, cinereous on the sides; eyes contiguous for the greater part of the front; mouth-parts yellowish; antennae brown to black, third segment very long acuminate below (fig. 61a); the bristles of the second antennal segment are very short compared with other species. *Thorax:* Mesonotum and scutellum subshining black, faintly gray dusted on the margins; metanotum and pleurae sparsely dusted with gray, subshining in ground color, sternopleurae shining on lower portions; humeri and halteres black, stems of halteres pale; propleurae bare; legs chiefly black, trochanters faintly yellow tinged, femora yellow on their apices, otherwise black; tibiae banded with brown to black medianly, otherwise yellow; first four tarsal subsegments yellow, fifth brown; posterior femora scarcely thickened, spines very weak; posterior tibiae slightly arcuate; basitarsi elongate, equaling the remaining tarsal subsegments in length. *Wings:* Faintly brownish tinged, iridescent; very broad and rounding apically; third section of costa less than one half to one third the length of the fourth section; stigma very short, occupying only the apical corner of the third section; fifth costal section shorter than third and fourth combined; crossvein r-m situated just beyond the end of the subcostal vein and at about basal one fifth of discal cell; last section of fourth vein (M_{1+2}) slightly curved, shorter in length than the portion of that vein from r-m crossvein to posterior crossvein (third section) (fig. 61f). *Abdomen:* Shining metallic black, first segment subshining, slightly grayed to opaque black; sides of abdomen gently rounding, widest at segments three to four; second and third segment about equal in length, fourth slightly longer than third; fifth segment slightly longer than fourth. *Hypopygium* almost as long as fifth abdominal segment, symmetrical, scarcely compressed to the right, with a small depression at base on right side (fig. 61b). Eighth segment without a visible membranous area at tip. Ninth segment black, harpagones yellowish. Ninth segment longer than wide and rather square-tipped apically, with a broad 'U' shaped cleft on posterior margin; segment not greatly developed and scarcely visible from lateral view (fig. 61g). Harpagones broad, blunt and short densely haired at apices. Cerci large and elongate, about equal to the length of the claspers (fig. 61e).

Length: body, 3.7 mm.; wing, 4.2 mm.

Female. Front shining black on upper three fourths, with two narrow stripes of gray extending from just above antennae part way up the eye margins. Shining portion of front slightly indented. Base of ovipositor black, short and globose; piercer yellowish, narrow, slightly longer than and abruptly terminating its base (fig. 61c); ovipositor reaching to the posterior margin of segment three.

Type locality: Logan Canyon, Utah.

Type at Utah State Agricultural College.

The writer has examined additional specimens from the type locality.

Dorilas (Eudorylas) subopacus (Loew)

(Plate 10, figs. 62a-e)

Pipunculus subopacus Loew, 1865, Centuria VI, Berl. Ent. Zeitsch. IX, 176.

Pipunculus confraternus Banks, 1911, Trans. Amer. Ento. Soc. XXXVI, 285. New synonymy established by comparison of types in Cambridge Museum of Comparative Zoölogy.

Pipunculus occidentalis Malloch, 1913, Proc. U. S. Nat. Mus. 43, 291. New synonymy.

This was described from a unique as a male of a new species having the eyes widely separated above the antennae. Upon examination of type the writer found that the sex of the specimen had been incorrectly determined; it is a typical female of *subopacus*. This mistake is very easy to make if one is not acquainted with the group, the female ovipositor is often folded up into a groove beneath the sixth segment so it is not always clearly visible from ordinary positions; in Malloch's specimen it is in plain sight if viewed from beneath.

Dorilas subopacus is related to *affinis* Cresson; the two are easily separated by the genital structures of both sexes; *subopacus* has the ovipositor short, not elongate and reaching to second abdominal segment as is stated in Cresson's key.

Male. Almost entirely bare species. *Head:* Face and front silvery pubescent, eyes joined for less than the length of the frontal triangle, a very narrow portion of the front exposed for short ways below the ocellar triangle; vertex shining black, occiput chiefly cinereous, more lightly grayed above; third segment of antenna brown, with a long white, acuminate tip below (fig. 62a); bristles of second antennal segment weak. *Thorax:* Subshining in ground color, dusted with brown on the dorsum, gray on the pleurae and metanotum. Humeri yellow; halteres chiefly yellow, knobs faintly browned; propleurae bare. In the typical *subopacus* the legs are chiefly pale in color, with dark bands on the femora, leaving yellow bases and apices; the tibiae are faintly discolored medianly and the last tarsal

subsegments are brownish. Femora slender, flexor bristles weak; posterior tibiae gently arcuate, front and middle tibiae with strong apical bristles; posterior basitarsi longer than the next three tarsal sections in length. *Wings*: Lightly iridescent; third section of costa equal to longer than the fourth, stigma completely filling the third section; fifth costal section shorter than the third and fourth combined; crossvein r-m situated just before the end of the subcostal vein and at basal one third of the discal cell; ultimate section of fourth vein slightly sinuate, about equal in length to the third section of that vein; last section of fifth vein shorter than posterior crossvein (fig. 62d). *Abdomen*: Subshining in ground color, densely brown pollinose, grayed on first tergum and on lateral margins of other segments; abdomen rather broad and flat, sides slightly rounded; fifth segment one and one third times as long as fourth. *Hypopygium*: Large, subshining and symmetrical, as wide as and about one and one half times the length of fifth segment with an inconspicuous small depression apically (fig. 62c). Eighth segment broad and rounding with no visible membranous area. Ninth segment slightly longer than wide and asymmetrical, being much more developed on the right side, apical cleft broadly 'U' shaped. Harpagones symmetrical with well developed lateral expansions on their bases (fig. 62e); apices of harpagones somewhat square tipped as seen from side view, long slender, rather acutely pointed from ventral. Aedeagus terminates in a slender three branched tip and the cerci are moderately developed, extending well beyond apex of ninth segment.

Length: body, 3.3-3.5 mm.; wings, 3.7-4 mm.

Female. The eyes are widely separated on the front and the front is polished black on the upper three fourths, silvery just above antennae. Abdomen more nearly shining and not so flattened as in male. Ovipositor very short sometimes hidden in a groove on the venter. This is formed by an overlapping of the sixth tergum beneath (fig. 62b). Base of ovipositor rather rounding and small, piercer a little longer than base in length (fig. 63a). Sixth tergum completely surrounding the apex of the abdomen, the lateral margins produced until they meet on the venter.

Type locality: Washington.

The writer has examined the type in Cambridge Museum of Comparative Zoölogy and specimens from the following localities; Trail Co., N. D., July 19, 1922 (A. A. Nichol); Manhattan, Kansas, June 9, 1934 (C. W. Sabrosky); Osborne, Kansas; 40 mi. N. Lusk, Wyoming, July '95; Magdalena, New Mexico; Great Falls, Va., June

29; Falls Church, Va.; Medicine Hat, Alberta; Black Mountains, North Carolina, July; East Lansing, Mich., Sept. 14, 1936 (C. Sabrosky); Middleton, Ct., June 17, 1909; Bath, Mich., June 6, 1940 (C. W. Sabrosky) and several localities in Massachusetts, New Hampshire and Minnesota.

Dorilas subopacus industrius (Knab)

(Plate 10, fig. 63a)

Pipunculus industrius Knab, 1915, Proc. Biol. Soc. 28, 83.

Pipunculus confraternus var. *melanis* Hardy-Knowlton, 1939, Ann. Ent. Soc. Amer. XXXII, 113-114. New synonymy.

This form described by Knab as *industrius* is unrecognizable from the original description. Upon examining the type the writer found it to be the same as variety *melanis*.

This is probably best considered a melanistic subspecies, for the most part it appears to be confined to Western United States. The subspecies is distinguished by having the legs more blackened. Only the extreme apices of femora yellow and the tibiae blackened medially. The third costal section and stigma of the wing are shorter than the fourth section, usually longer in the typical *subopacus*.

Length: body, 3.2-3.5 mm.; wing, 3.5-4 mm.

This is one of the most important parasites of *Eutettix tenellus*, the beet leafhopper, in the West and is no doubt of great benefit in the biological control of this pest. This subspecies is one of the most abundant DORILAIIDAE found in the beet leafhopper breeding grounds, it is also one of the few forms on which rearing data have been recorded.

Type locality: King City, California.

The writer has examined the type series at the United States National Museum and has, with Doctor G. F. Knowlton, previously recorded a long list of localities for this subspecies,²⁸ many of those records were reared from beet leafhopper. It is now known from the following states: Arizona, California, Colorado, Illinois, Iowa, Kansas, Idaho, Michigan, Minnesota, Montana, Nevada, New Mexico, Ohio, South Dakota, Texas, Utah, and Wyoming. Canadian provinces: British Columbia, Manitoba, Ontario, Quebec, and Saskatchewan.

The following are added records of rearings from beet leafhopper or collecting on host plants: Oakley, Idaho, 10-6-36 (swept from *S. pestifer*) (C. F. Henderson); Berger, Idaho, Fords Point, 6-4-35, swept from *Sofia*, (C. F. Henderson); Billings, Montana, 7-21-34,

28. Hardy-Knowlton, 1939, Ann. Ent. Soc. Amer. XXXII, 114.

reared from leafhopper on beets, (D. E. Fox); Davis, California, 8-31-34, Coll. on beets, (C. F. Henderson); East Hammett, Idaho, 6-29-34, reared from beet leafhopper (C. F. Henderson).

This species is commonly taken on the beet leafhopper host plants, sugar beets, *Salsola pestifer*, *Atriplex* spp., *Filaree*, *Bassia hyssopifolia*, *Cheirinia repanda*, et al. They are also taken in other plant associations, and may parasitize other species of leafhoppers; they were taken in abundance in an alfalfa field at Austin, Nevada.

Dorilas (Eudorylas) tarsalis (Banks)

(Plate 10, figs. 64a-d)

Pipunculus tarsalis Banks, 1911, Trans. Amer. Ento. Soc. XXXVI, 309-310.

Rather small, chiefly bare species, easily recognized by the small symmetrical hypopygium and the short broad claspers of the male.

Male. Head: Face and front silvery, vertex shining; occiput dull gray above, cinereous on the sides and below; occiput rather narrow, not greatly swollen; eyes joined on the front for about the length of the frontal triangle, very narrowly separated for a short distance below the ocelli; first two antennal segments brownish with a yellow tinge, bristles of second segment short; third segment yellowish, densely white pubescent with a very slender acuminate point below (fig. 64a); first two sections of aristae yellowish. *Thorax:* Mesonotum and scutellum subshining in ground color, covered with brownish pollen above, grayed on the sides; pleurae and metanotum gray; sometimes a faint yellowish tinge in the ground color of the pleurae; humeri and stems of halteres yellow, knobs of halteres brown to black; propleurae bare; coxae, trochanters and femora chiefly black, the apices and sometimes the extreme bases of femora are yellow; tibiae yellowish with brown discolorations medianly; apical subsegments of tarsi brownish, otherwise yellow; the basitarsi are longer than the next three tarsal subsegments and the claws are comparatively short. *Wings:* Faintly iridescent, third section of the costa much shorter than the fourth, stigma filling apical half of third section; fifth costal section shorter than the third and fourth combined; crossvein r-m situated at about the end of the subcostal vein and at basal one fourth of the discal cell; ultimate section of fourth vein almost straight, with but a faint curvature; petiole of cubital cell very short (fig. 64b). *Abdomen:* Short, rather broad with the margins gently rounding, widest at segments three and four; first tergum and base of second grayish dusted, dorsum of abdomen otherwise shining black; sides sometimes faintly dusted. *Hypopygium:* Faintly yellowish tinged, rather symmetrical with a de-

pressed area near base on the right side (fig. 64d). Ninth segment and harpagones yellowish; harpagones broad, short and rounding apically, covered with thick hairs (fig. 64c).

Length: body, 3-3.2 mm.; wings, 3.5-3.7 mm.

Female unknown.

Type locality: Ithaca, New York.

The writer has examined the type at Cambridge Museum of Comparative Zoölogy and has studied homotypes from the following localities: Swarthmore, Pa., Aug. 24, 1913 (E. T. Cresson); Falls Church, Va., Sept. 6 (N. Banks); Trout Lake Michigan, Aug. 25, 1925 (H. B. Hungerford). Also specimens from Sunnyside Canyon, Huachuca Mts., Arizona, July 9, 1940 (D. E. Hardy); Two Harbors, Minn., Aug. 14, 1937 (H. T. Peters) and Marshall Co., Kansas, July 10, 1927.

Dorilas (Dorilas) trichaetus (Malloch)

(Plate 11, figs. 65a-d)

Pipunculus trichaetus Malloch, 1913, Proc. U. S. Nat. Mus. 43, 296.

This species is known only from the female and although this sex is well distinguished it is questionable as to just where the males will belong.

Female. Description based upon type. *Head:* Third segment of antenna black, long acuminate below (fig. 65a) and densely covered with silvery pubescence; second antennal segment with two to three long yellow bristles below, reaching about half the length of the segment and several short black bristles above; face and front silvery; upper one third of front and vertex shining black; frontal stripe broadest at middle, with a distinct median elevation or tubercle just above the antennae; occiput silvery to cinereous, more faintly dusted above. *Thorax:* Pleurae and metanotum thickly gray dusted; humeri brown, sometimes faintly tinged with yellowish; halteres yellow, mesonotum and scutellum subshining in ground color with brown pruinosity, grayed on the sides; lateral margins of mesonotum with a few scattered long pale hairs; hind margin of scutellum with a row of eight or more rather weak black hairs; hind margins of propleurae each with a brush of long pale hairs; legs chiefly brown to black, extreme apices and bases of femora and tibiae and first four tarsal subsegments yellow, otherwise brownish to black; the posterior tibiae each with three to four long, pale serial hairs on the anterodorsal surface, at middle; hind tibiae slightly arcuate, bristles and hairs of all femora and tibiae rather strong; posterior basitarsi almost equal to the next four tarsal subsegments in length. *Wings:*

Third costal section slightly shorter than the fourth, stigma pale brown, almost filling the third section; fifth section of costa longer than the third and fourth combined; crossvein r-m situated slightly beyond the basal one third of the discal cell; ultimate section of the fourth vein straight, last section of fifth vein about equal to the posterior crossvein in length (fig. 65b). *Abdomen*: Subopaque dusted with brownish to gray, first tergum and lateral margins of other abdominal segments gray; abdomen rather short and broad. Base of ovipositor thick and globose, piercer sharply pointed, slightly shorter than and gradually tapering from its base (fig. 65d).

Length: body, 2.8-3.3 mm.; wing, 3 mm.

Male unknown.

Type locality: Mount Washington, New Hampshire.

The writer has studied the type at the United States National Museum and has homotypes from the following localities: Emery, Utah, Aug. 16, 1929 (P. W. Oman) and Sapinero Canyon, Colo., Alt. 9,000 ft., Sept. 5, 1938 (D. E. Hardy, A. T. Hardy). Specimens apparently belonging here have been examined from: Custer, South Dakota, July 15, 1924, and 12 m. N. W. of Lusk, Wyo., July, 1895.

Dorilas (Dorilas) varius (Cresson)

(Plate 11, figs. 66a-f)

Pipunculus varius Cresson, 1911, Trans. Amer. Ent. Soc. XXXVI, 309.

This species is well defined by its brown to black humeri, polished abdomen, chiefly yellow legs and yellow antennae. The male hypopygium is distinctive.

Male. Head: Front brownish gray pubescent, with a darker median spot; face silvery; occiput cinereous, brownish on upper portion; eyes joined on the front for about the length of the frontal triangle; mouthparts yellowish; first two antennal segments yellow-brown, third segment yellow to faintly brownish tinged, short acute (fig. 66a). *Thorax*: Subshining in ground color, mesonotum and scutellum brownish dusted above, grayed on the margins; pleurae and metanotum grayish; humeri brown to black; halteres yellowish, knobs brownish; propleurae each with a brush of nine to ten long yellow hairs on the hind margin; legs chiefly yellow, femora slender with distinct flexor bristles on apical portions; hind tibiae slightly bowed; posterior basitarsi equal in length to next three tarsal sub-segments. *Wings*: Iridescent tinged; third section of costa longer than the fourth, stigma completely filling the third section; fifth costal section about equal in length to the third and fourth combined; crossvein r-m situated beyond the end of the subcostal vein

and almost at the middle of the discal cell; last section of the fourth vein nearly straight, with a faint curvature, apical cell narrowly open in wing margin (fig. 66e). *Abdomen*: Somewhat rounding on the sides, widest at segments three and four; polished black on the apical portions of terga three to five, bases of terga opaque brownish; first segment grayish. The extent of the opaque and polished areas of the abdomen varies from almost entirely polished on segments two to five with only extreme bases of segments opaque, to entirely opaque on the second tergum and the broad bases of other segments. Fifth segment of abdomen one and one half the length of the fourth; hypopygium about three fourths the length of the fifth. *Hypopygium*: Asymmetrical with a distinct apical cleft, seventh tergum just barely visible on the left side; ninth segment sometimes plainly seen on the right side, from dorsal view (fig. 66e). Ninth segment and harpagones yellowish; harpagones symmetrical, rather short, stout and bluntly square tipped from side view (fig. 66f). From ventral view most of the eighth segment is membranous, the membranous area extending to the base of ninth segment. Ninth segment rounding at apices, with a deep 'V' shaped cleft in middle on posterior margin. Harpagones broad at bases and acutely pointed at apices, from this view (fig. 66d).

Length: body, 3.2 mm.; wings, 3.8 mm.

Female. Front cinereous on lower half, polished black on upper portion; widest in the middle, gently narrowed toward the vertex; occiput entirely yellow; femora sometimes with faint median discolorations. Base of ovipositor rather globose, faintly tuberculate beneath; piercer about as long as and gradually tapering from its base (fig. 66b). The end of the piercer usually extends to about the base of the abdomen due to the folding down of the apex of the abdomen. Otherwise like the male.

Type locality: Harrisburg, Pa.

The writer has studied the type at the Cambridge Museum of Comparative Zoölogy and has homotypes from the following localities: Glencarlyn, Va., July 7 (Banks); Holliston, Mass., Aug. 10 (N. Banks); Chesapeake, Beh., Md., Sept. 21, in Marsh (N. Banks); Falls Church, Va., May 16 (N. Banks); Moab, Utah, Aug. 23 1938 (G. F. Knowlton, F. C. Harmston). Other material has been examined from the following states and Canadian provinces: British Columbia, Florida, Michigan, Missouri, New Brunswick, New York, Ohio, Ontario, Utah, and Wyoming.

Dorilas varius var. *mainensis* (Cresson)

Pipunculus mainensis Cresson, 1911, Trans. Amer. Ent. Soc. XXXVI, 298. New combination.

Examination of the types showed that these were structurally the same species and study of a large series of specimens has proved it to be a rather variable species; all degrees of intergradation between these have been observed. The two varieties may best be separated by the third antennal segment being yellow in typical *varius* and black in *varius mainensis*. The latter usually slightly larger; the abdomen usually more opaque and the femoral rings more distinctly black. The membranous apex of hypopygium is large and distinct, not small as in var. *phaethus*.

Length: body, 3.5-4 mm.; wing, 4-4.4 mm.

Type locality: Fort Kent, Maine.

The writer has examined the type at the Boston Society of Natural History, and has homotypic females from Pingree Park, Colo., Aug. 14, 1934, 9,200 ft. (C. W. Sabrosky) and Brownsville, Texas, 7-3-38, (R. H. Beamer). It has also been identified from a number of localities in the following states and Canadian provinces: Alberta, Arizona, British Columbia, California, Idaho, Michigan, Nevada, Utah, and Washington.

Dorilas varius var. *phaethus* (Hardy-Knowlton)

Pipunculus varius var. *phaethus* Hardy-Knowlton, 1939, Ann. Ento. Soc. Amer. XXXII; 123-124.

This variety is distinguished by having the antennae entirely black and the apical depression of hypopygium very small. Following is the original description:

"Male. Second segment of antennae short acute, black with two to three hairs above and a number of short bristles below; third segment brownish, white fringed on margins; arista pale yellow basally, otherwise shining black. Halteres yellow, knobs slightly darker.

"Mesonotum and scutellum subshining with fine brownish yellow pubescence, lateral margins, humeri, pleurae and metanotum cinereous. Coxae shining black, trochanters yellow; femora, tibiae and tarsi chiefly yellow, femora with broad black rings at their middles, tarsal segments four and five slightly brownish. Middle trochanters with a long yellow hair above. All femora with a row of fine yellow hairs on the sides slightly dorsal (these are sometimes difficult to discern); femoral spines developed on anterior half, posterior tibiae slightly arcuate.

"Abdomen chiefly shining black, first segment cinereous, second segment opaque basally, subshining apically, other segments polished and metallic. Hairs of lateral comb on first segment yellow (on one paratype the combs are black). Hypopygium shining but slightly dusted, compressed to the right;

rather small from dorsal view. Ventral processes developed, reaching to base of fifth segment. Hypopygium with an apical cleft barely visible in dorsal view.

"Wings hyaline with a slight iridescent tinge; ultimate section of fourth vein straight or nearly so. Last section of fifth vein slightly sub-equal to posterior crossvein. Anal cell with a long petiole. Crossvein r-m slightly beyond end of auxiliary vein and basal one-third of discal cell.

"Length: wing, 4.5-5 mm.; body approximately 4 mm.

"Female unknown."

Type locality: Paradise, Utah.

Type in United States National Museum.

Dorilas (Eudorylas) vierecki (Malloch)

(Plate 11, figs. 67a-f)

Pipunculus vierecki Malloch, 1913, Proc. U. S. Nat. Mus. 43, 654-655.

This species is easily recognized by its yellow legs and halteres, its long acuminate antennae and large size. It is related to *atlanticus* (Hough) and *varius* (Cresson).

Male. Large, almost entirely bare species. *Head*: Exceptionally large, about equal or slightly larger than thorax. Eyes joined for about the length of the frontal triangle, very narrowly separated above and below; face and front opaque black in ground color, entire face and that portion of frontal triangle just above antennae densely silvery pubescent; upper portion of triangle bare, except for a few pale microscopic hairs on eye margins; occiput rather broad, subshining black in ground color, lightly gray dusted; antennae bright yellow, except brown to black third section of arista; bristles of second antennal segment short and black; third segment long acuminate, densely white pubescent (fig. 67a). *Thorax*: Mesonotum and scutellum subopaque black in ground color, densely covered with microscopic yellow-brown scales, replaced by grayish scales on the margins; scutellum faintly rugose; pleurae and metanotum cinereous, pleurae yellowish tinged in ground color; propleurae bare; humeri brown to black with yellowish margins; halteres yellow; legs bright yellow, coxae brown, tarsi faintly brownish tinged; femora moderately thickened with the flexor bristles well developed on apical halves; posterior tibiae arcuate; posterior basitarsi longer than the next three tarsal subsegments. *Wings*: Lightly iridescent; third costal section slightly shorter than the fourth, stigma not quite filling third section; fifth costal section about equal to third and fourth combined; crossvein r-m situated just beyond the end of the subcostal vein and at about the basal one third of discal cell; last section of fourth vein faintly curved (fig. 67d). *Abdomen*: Subopaque in ground color, heavily dusted with brown to gray; first

tergum and margins of other segments gray, this gray pollen extending for a short way up into the dorsum on posterior margins; hind margin of fifth segment only narrowly marked with brown in the middle. Abdomen rather short and rounding on the sides, broadest at segment three; fifth segment about one third longer than the fourth; hypopygium about three fourths the length of the fifth segment. Hypopygium subquadrate in outline with a large apical depressed area; seventh tergum scarcely visible from above (fig. 67e); ninth segment and harpagones yellowish. From ventral view the membranous area of the eighth segment is very extensive, with a broad band of sclerite separating it from ninth segment. Ninth segment about as broad as long, cleft on hind margin, broadly 'V' shaped and extending about two thirds the length of segment on a middle line. Harpagones very broad, bluntly rounded apically. Cerci only moderately developed, extending just beyond apex of ninth (fig. 67f).

Length: body, 4.5-5.1 mm.; wing, 5-5.4 mm.

Female. Eyes narrowly separated on the front, frontal stripe slightly widened in the middle; front cinereous on lower half, grayish to subshining black on upper portion. Sides of abdomen more cinereous than in male. Base of ovipositor short, somewhat rounding with a very distinct projection at about the middle below; piercer long and slender, over two times as long as, and abruptly terminating its base (fig. 67c); tip of piercer extending to the base of the abdomen. The specimens studied have been slightly smaller than the male.

Length: body, 3.8-4 mm.; wing, 4-4.2 mm.

Type locality: Plummers Island, Maryland.

The writer has examined the type at the United States National Museum and the description of the male is based upon a homotype. Specimens have been identified from Holliston, Massachusetts, July 10 (N. Banks); Raleigh, N. C., 24-VI-30 (C. S. Brimley) and Madison C., Texas, June 23, 1934 (H. J. Reinhard).

Dorilas willistoni (Kertész)

Pipunculus willistoni Kertész, 1900, Wiener Ent. Zeit. XIX, 244. Change of name.

Pipunculus aculeatus Williston, (nec Loew), Bio. Cent. Amer. III, 89.

This species cannot be accurately placed from the original description and until the type can be studied, its position will remain doubtful; it appears to be related to *vierecki* (Malloch) and *pallipes* (Johnson) but as so many of the characters are questionable no attempt has been made to incorporate it in the key to the species of *Dorilas*. The following is the original description:

"Face black, densely silvery-pubescent. Front black, lightly pollinose. First two joints of antennae black; the third joint lightly yellow, produced below into a slender point. Thorax black, brownish-pollinose on the dorsum, gray-pollinose on the pleurae. Abdomen shining black; first segment and the lateral margins of the following segments opaque gray-pollinose. Wings nearly hyaline; penultimate section of the fourth vein more than twice the length of the antepenultimate section.

"Length 3 millim.; of the wings, 4 millim."

Type locality: México, Teapa in Tabasco.

Type probably in British Museum.

Collinias Aczel

Collinias Aczel, 1940, Zoöl. Anzeiger, 1.12. Bd. 132, Heft 7/8, 151.

This genus is characterized by having the third costal section closed by a supernumerary crossvein; the stigma is short, not filling the third section; the propleurae each possess a fan of long hairs; the base of the abdomen is transparent yellow in all known species. *Collinias* are apparently confined to the Australian region.

Genotype: *Collinias heterostigmus* (Perkins), 1905.

Claraeola Aczel

Claraeola Aczel, 1940, Zoöl. Anz. 1.12. Bd. 132, Heft 7/8, 151.

This genus is characterized by the well-developed posterior lobe of the wing; the small obtuse third antennal segment, third scarcely larger than the second; vein M_{1+2} forked, M_2 present as an appendix of the fourth vein. The propleurae are bare, stigma present in wing, third costal section almost as long or longer than the fourth and the abdomen usually entirely opaque. This contains one large species from Formosa, 7.5-8 mm.

Genotype: *Claraeola adventitia* (Kertész), 1912.

Beckerias Aczel

Beckerias Aczel, 1939, Dorylaiden-Studien IV, Zoologischer Anzeiger, 1.6. Bd. 126, Heft 7/8, 191-195.

This genus has been erected to contain a remarkable Hungarian species with a rudimentary anal vein; it is well defined in that the anal vein (A_1) is either completely lacking or but a stump of the vein is present in the wing base at the junction of anal and cubitus. To date but a single species is known in this genus; it is one of the few known genera which apparently do not occur in the New World.

Genotype: *Beckerias pannonicus* Aczel; type locality: Komitat Zala, Hungary.

Anacephalops Aczel

Anacephalops Aczel, 1940, Zool. Anz. 1.12. Bd. 132, Heft 78, 151.

This genus is characterized by having vein M_{1+2} forked, vein M_2 present as an appendix on fourth vein and stigma absent in the wing. This is the only known genus possessing this combination of characters.

Genotype: *Anacephalopa amboinalis* (Walker), 1861.

Allomethus n. genus

The species in this genus are characterized by having no stigma in the wing, posterior lobe moderately developed; crossvein r-m situated near basal part of discal cell; eyes of the male holoptic and the abdomen gently tapering posteriorly; hypopygium small, rather inconspicuous; third segment of antennae acute to obtuse or rounding below. The genus is related to *Tömösváryella* and *Dorylomorpha*; it differs from the former in the position of crossvein r-m, the shorter third antennal segment and peculiar form of the hypopygium as well as the more elongate wings. The genus differs from *Dorylomorpha* in having the eyes of male joined on the front; acute to obtuse third antennal segment; abdomen tapering and hypopygium small instead of abdomen clavate and hypopygium swollen as in *Dorylomorpha*. The legs are yellow in the three species included here; this may or may not be characteristic of the genus.

Genotype: *Allomethus brimleyi* n. sp.

KEY TO SPECIES

1. Third costal section elongate, two to three times the length of the fourth..... 2
Third costal section short, about one third the length of the fourth section; antennae yellow, third segment obtuse; abdomen opaque brownish... *flavicornis* (Williston), p. 129
2. Entirely opaque species; third antennal segment broadly obtuse to rounding below, brownish in color; humeri brownish black..... *brimleyi* n. sp., p. 128
Abdomen shining black, lateral margins in part yellowish; third antennal segment acute, yellowish in color; humeri yellow..... *xanthopodus* (Williston), p. 130

Allomethus brimleyi n. sp.

(Plate 11, figs. 68a-c)

This species is apparently related to *flavicornis* (Williston) and *xanthopodus* (Williston) but is strikingly different from these, as well as from all other known Dorilaidae. It is most easily recognized by its minute hypopygium, yellow legs, obtuse third antennal segment and characteristic wing venation.

Male. Entirely opaque, thinly pilose species. *Head:* Eyes joined for almost two thirds the length of the front; frontal triangle, above antennae, opaque velvety black; face brownish to gray pubescent;

mouthparts yellow; antennae brownish with a faint tinge of yellow; third segment small, scarcely twice the size of the second, broadly obtuse to rounding below (fig. 68a); aristae distinctly three segmented; occiput rather narrow; entirely gray pollinose, rather thinly so above, with the black ground color showing through. *Thorax*: Mesonotum and scutellum opaque brown; metanotum grayish brown dusted; pleurae opaque brownish with a distinct tinge of yellow; humeri brownish black, stems pale; propleurae bare; coxae of legs brown to black, legs otherwise yellow; femora slender with two rows of weak spines below on the apical portions of the posterior pair; posterior basitarsi equal in length to the remaining tarsal subsegments. *Wings*: Brownish tinged, iridescent, no discernible stigma; third section of costa elongate, five to six times as long as fourth section; costal margin of third section strongly swollen; fifth section of costa longer than third and fourth combined; crossvein r-m situated at or slightly before the end of the subcostal vein and at the basal one fourth of discal cell; R_5 almost straight, but faintly curved as it runs from r-m crossvein to apex of the wing; last section of fourth vein (M_{1+2}) straight (fig. 68b); posterior lobe distinct. *Abdomen*: Opaque brown, first segment dusted with gray, apical margins of segments two to five very faintly gray fasciated. Sides of abdomen rounding, widest at segments two to three. Hypopygium very minute, scarcely visible from above, about one fifth the length of the fifth segment, rather symmetrical with an apical depression on the right side (fig. 68c).

Length: body, 3.8-4.2 mm.; wing, 4.7-5 mm.

Female unknown.

Holotype ♂, Raleigh, North Carolina, Aug. 6, 1924 (C. S. Brimley); one paratype ♂ same locality and collector, July 19, 1935.

Types are in Snow Entomological Collection.

Allomethus flavicornis (Williston)

(Plate 11, fig. 69a)

Pipunculus flavicornis Williston, 1892, Bio. Cent. Amer. III, 89.

The generic position of this species is not certain. It cannot be placed from the original description. According to the notes made by Doctor John Smart, of the type female in the British Museum; it appears to belong in *Allomethus*. Specimens in the United States National Museum collection determined *flavicornis* proved to be females of *Dorilas pallipes* (Johnson). The following is the original description:

"Front very narrow, the sides unusually convergent above; the ground-colour black, but covered, like the face, with silvery pubescence, less distinctly so above. Antennae light yellow; third joint obtusely pointed below, ovate; arista black. Thorax black, the dorsum dark brown-pollinose; pleurae silvery. Abdomen opaque coffee-brown; segments two to six broadly opaque silvery-grey on the sides, an interrupted posterior band, more brownish in colour, extending across them; first segment grey, narrowly brown in front; ovipositor yellowish-red. Legs light yellow, including the coxae, excepting only the terminal joint of the tarsi, which is blackish; the minute black spines, arranged in longitudinal rows, are conspicuous. Wings nearly hyaline; penultimate section of the fourth vein more than twice as long as the antepenultimate section; small cross-vein opposite the tip of the auxiliary vein. Length 5 millim.; of the wings, 6 mm."

The following notes are added from the observations of Doctor Smart: No stigma present in wing; third costal section short, about one third the length of the fourth section; crossvein r-m situated at about basal one third to one fourth of the discal cell (fig. 69a); humeri yellow.

Type locality: México, Amula in Guerrero.

Type in British Museum.

Allomethus xanthopodus (Williston)?

(Plate 11, fig. 70a)

Pipunculus xanthopodus Williston, 1892, Bio. Cent. Amer. III, 87-88.

From the original description *xanthopodus* appears to be related to *Dorylomorpha flavomaculata* (Hough) but the report of Doctor John Smart after studying the type in the British Museum proves it to be very different. Doctor Smart states that the r-m crossvein is situated near the base of the discal cell and wings without a stigma. These characters would indicate that it belong in *Allomethus* but as the hypopygium or the shape of the abdomen was not indicated it is placed here with a query until the type can be studied further. The following is the original description:

"The small frontal triangle and the face black, densely silvery-pubescent. Antennae: basal joints black, or blackish; third joint light yellow, in shape acutely pointed below; arista black, thickened at its base. Dorsum of thorax brown; pleurae and metanotum silvery-grey-pollinose. Abdomen shining black, the lateral margins in part yellowish; the first and second segments entirely, and the successively narrower sides of the third, fourth, and fifth segments, grey-pollinose, opaque. Legs, including the coxae in part, light yellow; femora stout, distally with a double row of short spines below. Wings nearly hyaline; anterior crossvein nearly opposite the tip of the auxiliary vein; ultimate section of the fourth vein sinuous, without stump; penultimate section about three times the length of the antepenultimate section. Length 5 millim.; of the wings, 7 millim."

The following can be added to the description from the notes of Dr. Smart: Crossvein r-m at about basal one fourth to one fifth of discal cell; third costal section of the wing twice the length of the fourth (fig. 70a); humeri yellow.

Type locality: México, Sierra de las Aguas Escondidas in Guerrero.

Type in British Museum.

Dorylomorpha Aczel

Tömösváryella (*Dorylomorpha*) Aczel, 1939, Zoöl. Anzeiger, Band 125, Heft ½, Zeit 22.

Dorylomorpha was proposed as a subgenus of *Tömösváryella* to include those species which have the r-m crossvein situated near the base of the discal cell. This is applicable to our North American species but should be raised to generic rank. Aczel acknowledged this ranking in his latest paper.²⁹

The genus as here recognized takes in those species having no stigma in the wing; r-m crossvein in the basal one sixth to one fourth of the discal cell; eyes of male dichoptic, distinctly separated on the front. The posterior margin of the compound eyes is curved inward on upper half so that the occiput is broader, more swollen above. The abdomen is elongate and strongly swollen apically, clavate in both sexes especially from lateral view; all the known North American species are polished black in ground color. The third segment of the antennae is acuminate pointed and the third costal section is very short compared to the fourth.

This group appears to be intermediate between *Tömösváryella* and *Dorilas*, possessing many characters in common with both of these genera; the characteristics of the head, wings and abdomen make it distinctive.

Genotype: *Pipunculus rufipes* Meigen (of Europe.)

KEY TO MALES

1. Hypopygium symmetrical, without a distinct membranous depressed area at apex, never quadrate in outline..... 2
- Hypopygium more asymmetrical, with a distinct apical depression, or rather quadrate in outline with an indented area on the left side..... 3
2. Antennae bright yellow; third segment very long acuminate; femora chiefly yellow, with only narrow rings of black; ninth segment yellow...*atramontensis* (Banks), p. 132
- Antennae entirely black; third segment short acuminate; femora mostly black, only apices yellow; ninth segment black.....*tridentata* n. sp., p. 141
3. Femora chiefly black, only apices yellow; tibiae usually blackened..... 4
- Legs almost entirely yellow; femora never with more than narrow bands of black or median discolorations..... 7

29. 1940, Zoöl. Anz., 1.12. Bd. 132, Heft 7/8.

4. Eyes narrowly separated on the front; frons much narrower than width of ocellar triangle 6
5. Eyes widely separated; front at least as broad as ocellar triangle..... 5
5. Harpagones strongly flattened laterally, and very irregular; outer harpagone curved downward at apex; the inner has a number of small tubercles on margins (fig. 77b); sixth tergum greatly developed, about equal to eighth segment and with a pair of fingerlike processes on posterior margin (fig. 77c); abdomen greatly swollen posteriorly *ornata* n. sp., p. 139
- Harpagones boot-shaped at apices, more equal in size and shape (fig. 74e); sixth tergum normal; abdomen not so strongly swollen posteriorly..... *exilis* (Malloch), p. 136
6. Eighth segment rather quadrate in outline, with no distinct membranous area at apex but with an indented area on left side; harpagones slender at apices..... *caudelli* (Malloch), p. 135
- Eighth with a very distinct membranous depressed area extending almost to base of segment; harpagones expanded laterally at apices..... *uncinata* n. sp., p. 142
7. Legs entirely yellow; sides and venter of abdominal segments two to four broadly yellow; harpagones slender and rather acutely pointed... *flavomaculata* (Hough), p. 137
- Femora blackened medianly; abdomen shining black except in occasional specimens of *canadensis* n. sp., harpagones not as above..... 8
8. Tibiae discolored medianly; harpagones boot-shaped, curved to the right at their apices from ventral view (fig. 76e)..... *occidens* (Hardy), p. 139
- Tibiae entirely yellow; harpagones asymmetrical, the inner harpagones is trilobed and the outer is slightly enlarged at apex (fig. 72d); sides of segments three and four sometimes yellowish..... *canadensis* n. sp., p. 133

KEY TO KNOWN FEMALES

1. Abdomen shining black..... 3
- Sides of abdominal segments two to four and entire venter yellow..... 2
2. Ovipositor strongly flattened dorsoventrally; third antennal segment black; femora blackened medianly *canadensis* n. sp., p. 133
- Ovipositor not so flattened, more rounding above; third antennal segment yellow to yellow-brown; femora usually completely yellow..... *flavomaculata* (Hough), p. 137
3. Ovipositor flattened dorsoventrally, base elongate..... 4
- Base of ovipositor rounding, not flattened above..... 5
4. Third antennal segment long acuminate; trochanters and tibiae chiefly black; hind tibiae with numerous strong yellow hairs on dorsal surfaces near middles, *ornata* n. sp., p. 139
- Third segment short acuminate; trochanters and tibiae yellow; hind tibiae lacking the strong dorsal hairs..... *tridentata* n. sp., p. 141
5. Tibiae and tarsi chiefly black; all tibiae armed with strong median bristles, apical bristles strong on front and middle tibiae..... *exilis* (Malloch), p. 136
- Tibiae and tarsi chiefly yellow; tibial bristles weak..... 6
6. Piercer of ovipositor distinctly articulated with its base; base rather tuberculate below and elongate (fig. 79d)..... *uncinata* n. sp., p. 142
- Piercer not distinctly articulated with base; base subglobose, more rounding and without tubercle (fig. 73e)..... *caudelli* (Malloch), p. 135

Dorylomorpha atramontensis (Banks)

(Plate 11, figs. 71a-b)

Pipunculus atramontensis Banks, 1911, Trans. Amer. Ent. Soc. XXXVI, 312.

Male. Head: Antennae bright yellow, third segment very long acuminate (fig. 71b); eyes very narrowly separated, front shining on upper two thirds, silvery on lower one third. *Thorax:* Subshining black, lightly brownish gray dusted; humeri black, halteres yellow; propleurae bare; legs yellow, femora with rather narrow

black rings near their bases. These are much wider on the hind femora; femora slender, spines weak. *Wings*: Iridescent; third costal section short, one fifth to one sixth the length of the fourth; stigma absent; ultimate section of fourth vein but faintly curved; crossvein r-m situated near the base of discal cell. *Abdomen*: Polished black, very faintly dusted; rather long and swollen greatly toward the apex, as seen from lateral view. Hypopygium symmetrical, but slightly compressed to the right and with no distinct depression; slightly shorter than fifth segment in length (fig. 71a); ninth segment and harpagones yellowish.

Length: body, 5.0 mm.; wings, 5.6 mm.

Female unknown.

Type locality: North Fork of Swannanoa River, Black Mts., North Carolina.

The writer has examined the type and paratype at the Cambridge Museum.

Dorylomorpha canadensis n. sp.

(Plate 12, figs. 72a-f)

This species is related to *tridentata* by the genital characters and to *flavomaculata* by the coloring of the females and occasional male specimens. The inner harpagones of the male is characteristic because of the moderately developed ventral lobe and the strong lateral and apical lobes. The outer harpagone enlarges at the apex, instead of tapering to an acute point as in the two above species. The females are distinguished from *tridentata* by having the sides of abdominal segments three and four largely yellow and the black bands of the femora not so broad; they are distinguished from *flavomaculata* by the strongly compressed ovipositor, the black antennae and blackened femora.

Male. Head: Eyes narrowly separated on the front, the median portion of the front being scarcely wider than the median ocellus; upper half of front shining black, lower portion silvery pubescent; middle portion of front somewhat convex longitudinally; antennae moderately acuminate (fig. 72a), rather thickly white pubescent; mouthparts yellow; hind margins of compound eyes indented on upper halves, so that the occiput is much broader on upper portions. *Thorax*: Polished black in ground color, very lightly dusted on the sides and metanotum; dorsocentral hairs very weak; humeri black, halteres bright yellow. *Legs*: Coxae black with yellow apices, trochanters, tibiae and tarsi entirely yellow, femora chiefly so but blackened medianly, the blackness being more extensive on the dor-

sal surfaces of the femora and slightly interrupted with yellow on lower surfaces. Hind trochanters slightly swollen below; femora moderately developed, spines absent. Tibiae almost straight, apical bristles of front pair moderate. *Wings*: Iridescent, with a somewhat dusky appearance. The third section of costa is about one fourth as long as fourth section; fifth section about equal to the third and fourth combined; crossvein r-m situated near the basal one fifth of discal cell and beyond end of subcostal vein; ultimate section of fourth vein very slightly curved. *Abdomen*: Polished black in most specimens; a few individuals are on hand which have the sides of segments three and four yellowed, as in *flavomaculata*. Abdomen greatly enlarged posteriorly, especially as seen from lateral view. Fifth terga about one and one third times the length of fourth. *Hypopygium*: About three fourths the length of the fifth abdominal segment, slightly compressed to the right and with a conspicuous apical membranous area (fig. 72e). From ventral view the sixth tergum is greatly developed, larger than the eighth segment and serves to give support to the genital chambers; its inner margin is produced into a large lobe that fits beneath the harpagones; this is concave on its ventral surface. The seventh tergum is comparatively narrow with its inner margin terminating in a beaklike apex and its posterior margin rather strongly curved (fig. 72b). The membranous portion of the eighth extends more than half the length of the segment on a middle line. The ninth segment is scarcely longer than wide with a 'U' shaped cleft on anterior margin. Inner harpagone trilobed, with large rounding lateral and apical lobes and a smaller ventral lobe; the outer harpagone is thick at base, slightly enlarged at apex and concave on inner margin (fig. 72d). Cerei small, not greatly developed.

Length: body, 3.8-4 mm.; wings, 4.8-5.1 mm.

Female. Front broad, wider than ocellar triangle, polished black on upper half to two thirds, pubescent below; median portion of front convex as in male. Sides of abdominal segments two to four and all of the venter, bright yellow, interrupted on the dorsum by broad black spots. Ovipositor yellowish to red in color, base strongly flattened dorsoventrally (fig. 72e), piercer about equal to its base in length and distinctly articulated; piercer somewhat tuberculate near base below (fig. 72f).

Length: body, 3.6 mm.; wing, 4.3 mm.

Holotype ♂ : Cypress Hills, Sask., June 4, 1939 (A. R. Brooks). Allotype ♀ and twenty eight paratypes, nineteen ♂ ♂, nine ♀ ♀ same data as type.

Holotype, allotype and fifteen paratypes returned to the Canadian National Museum, others retained in Snow Entomological Collection.

Dorylomorpha caudelli (Malloch)

(Plate 12, figs. 73a-g)

Pipunculus caudelli Malloch, 1913, Proc. U. S. Nat. Mus. 43, 298-299.

This species is related to *exilis* (Malloch) but can be separated by the characters given below.

Male. Head: Eyes dichoptic narrowly separated on the front; front silvery directly above antennae, shining black on upper one half to three fourths, front convex, slightly swollen and protruding above the eye height; antennae brown to black, third segment long acuminate (fig. 73a), white at the tip and covered with dense fine white pile. *Thorax* and abdomen shining, very lightly pruinose with fine white, sparsely distributed pile; humeri black, stems of halteres yellow, knobs faintly brown; coxae, trochanters and femora black, apices of femora yellow; tibiae and tarsi chiefly yellow, with a narrow ring of black on the tibiae; hind tibiae gently arcuate. *Wings:* Lightly iridescent; third costal section one fourth to one fifth the length of the fourth, stigma absent (fig. 73d); crossvein r-m situated at basal one sixth of discal cell, before the end of the subcostal vein; ultimate section of fourth vein slightly sinuate; last section of fifth vein equal in length to posterior crossvein; petiole of cubital cell comparatively long. *Abdomen:* Entirely shining to faintly brown dusted, without any signs of fasciae; sides almost straight, abdomen gently enlarging posteriorly, being broadest at segment five. Seventh sclerite scarcely visible from external, dorsal view; hypopygium rather small when viewed directly from above, eighth segment somewhat quadrate, with a distinct indented area on left side of apex; no distinct membranous area (fig. 73f). Ninth segment broad, about as wide as long, rounding at apices and with a small "U" shaped cleft on posterior margin in middle. Harpagones rather slender, acutely pointed at apices (fig. 73e). Ninth segment and harpagones yellow; hypopygium one fourth to one fifth the length of the fifth segment. From lateral view the abdomen is distinctly clavate (fig. 73g).

Length: body, 3.5 mm.; wing, 4 mm.

Female. The eyes are widely separated, the front at least as wide as ocellar triangle for its entire length, widest at middle portion and with a shining black elevated area extending longitudinally to about the lower one third. Lower third of front, entire face and narrow stripe extending dorsad along eye margins, silvery pubescent. Slen-

der tip of third antennal segment even longer than in the male. Bases of hind femora yellow. Base of ovipositor black, rather subglobose, not flattened dorsoventrally (fig. 73b); piercer yellow, about equal to its base (fig. 73c) and extending just beyond posterior margin of the third abdominal segment. Otherwise like male.

This is the first report of the female of this species.

Type locality: Kaslo, British Columbia, Canada.

The description of the male is based upon the type in the National Museum Collection.

Added distribution: Port Renfrew, British Columbia, June 22, 1901; Vancouver, B. C., May 20-24, 1906 (R. V. Harvey, R. S. Sherman); Burke Falls, Ontario, July 9, 1926 (F. P. Ide).

Dorylomorpha exilis (Malloch)

(Plate 12, figs. 74a-c)

Pipuncubus exilis Malloch, 1913, Proc. U. S. Nat. Mus. 43, p. 295.

This species is related to *caudelli* (Malloch) but is distinguished by the broad front of the male, the blackened tibiae and tarsi as well as genital characters.

Male. Rather bare species with only scattered pale hairs on thorax and abdomen. *Head*: Front scarcely narrowed, almost as wide toward vertex as that portion just above the antennae; shining black on upper half, silvery below; front with a convex ridge on upper portion which extends the shining black into the upper median part of the silvery area; face dull grayish, broader than front; mouthparts yellow-brown; third segment of antennae long acuminate (fig. 74a), brown with dense silvery pubescence; second segment with only weak bristles; occiput subshining black above, cinereous on the sides and lower portions, eyes indented above, causing occiput to be broader on upper portion. *Thorax* and abdomen shining black, very faintly dusted with brownish and covered with scattered pale pile; metanotum and pleurae gray dusted; legs chiefly black, only extreme apices of femora and tibiae and bases of tibiae yellow, tarsi yellow to brownish; femora slender with no distinct bristles or flexor spines; front and middle tibiae with moderately strong apical bristles below; hind tibiae arcuate; basitarsi about equal to next three tarsal subsegments in length. *Wings*: Hyaline, only faintly iridescent; third section of costa short, one fourth to one fifth the length of the fourth section; fifth section of costa shorter than third and fourth combined, scarcely longer than fourth section; crossvein r-m situated at about end of subcostal vein and at basal one fifth of discal cell; ultimate section of fourth vein strongly sinuate, last section of fifth

vein about equal to posterior crossvein in length (fig. 74c). *Abdomen*: Elongate, broad apically, widest at segment five. Hypopygium rather small, somewhat symmetrical, about one fourth the length of segment five and with a small apical depression on the right (fig. 74d). Ninth segment black, harpagones yellow. From ventral view the ninth segment is slightly longer than broad, longer than the sclerotized portion of the eighth segment and with a distinct indentation near base on outer margin; hind margin of ninth with a small "U" shaped cleft in the middle. Harpagones very irregular, the inner margins nearly straight but the outer margins greatly curved, the apices produced bootshaped; the outer margins are developed into obtuse to acute points just above middles (fig. 74e).

Length: body, 3-3.5 mm.; wings, 4-4.5 mm.

Female. Front wider than ocellar triangle, polished black on upper two thirds, silvery below; posterior tarsi strongly flattened. Base of ovipositor rather elongate with a slight tubercle near apex below; piercer about as long as base (fig. 74b). This is the first report of the female.

Type locality: Medicine Hat, Alberta, Canada.

The writer has examined the type in the National Museum Collection and has homotypic specimens from: Buck Creek, Wyo., Sept. 14, 1895 (W. M. Wheeler); Walden, Colo., Aug. 20, 1931 (H. T. Peters); Big Horn Co., Timber Line, Wyo., Aug. 1910; and Logan Canyon, Utah, Aug. 28, 1938 (D. E. Hardy, G. S. Stains). Specimens have also been identified from the following states and Canadian Provinces: Alberta, California, Colorado, Michigan, New Mexico, Saskatchewan and Utah.

Dorylomorpha flavomaculata (Hough)

(Plate 12, figs. 75a-f)

Pipunculus flavomaculata Hough, 1899, Proc. Bost. Soc. Nat. Hist. XXIX, 85.

This is a very striking species easily recognized by the yellow sides and venter of abdominal segments two to four.

Male. Almost bare species, with very sparse pale pile on dorsum of thorax and abdomen. *Head*: Eyes dichoptic, front rather narrowly separated from median portion to ocelli; silvery on lower one half, shining black above; front convex, slightly gibbose in the middle; occiput subshining black above, cinereous below; posterior margin of eyes markedly curved inward on upper one half of head, from lateral view, causing the occiput to be wider and much more swollen above; third antennal segment yellow-brown in ground color covered with dense white pubescence, acuminate; bristles of second segment

weak (fig. 75a); mouthparts yellow. *Thorax*: Mesonotum subshining brownish in ground color, lightly pruinose, faintly grayed on margins and on pleurae and metanotum; humeri black, halteres bright yellow; legs slender, entirely yellow, femora with only very weak spines beneath toward their apices. *Wings*: Faintly iridescent; third costal section very short, one third to one fourth the length of the fourth section; fifth section much longer than third and fourth together; crossvein r-m situated slightly before end of subcostal vein and at basal one sixth or seventh of discal cell; third section of fourth vein longer than last section, last section slightly curved; last section of fifth vein shorter than posterior crossvein; petiole of cubital cell short (fig. 75b). *Abdomen*: Polished with only first tergum cinereous; lateral margins and sterna of segments two to four yellow, otherwise brown to black; sometimes the yellow extends toward the dorsum so that only a broad stripe of black remains; fifth segment shining black. Abdomen rather slender, greatly enlarged apically as seen from lateral view (fig. 75f), widest at segment five from above. *Hypopygium*: About as long as fifth segment, asymmetrical, triangular, rather pointed apically, and with a distinct depressed area on the right side of the apex from dorsal view (fig. 75e). From ventral view the membranous area covers the entire apex of the eighth segment. Ninth segment yellow-brown, harpagones bright yellow; ninth segment longer than the sclerotized portion of the eighth segment, from base of ninth to membranous portion; ninth with a small "U" shaped cleft on hind margin. Harpagones rather asymmetrical; the outer harpagone is elongate and slender, somewhat tapering and curved inward at apex; inner harpagone thick at base and with an acute point on its outer apex (fig. 75d).

Length: body, 4 mm.; wings, 4 mm.

Female. Front much wider than in male, shining black on upper one half, silvery below, occiput very wide on upper portion. Femora faintly discolored on upper portions near bases. Abdomen more slender, not so swollen apically as in male, widest at segments five and six. In some specimens the abdomen is almost entirely yellow, with only a narrow stripe of black down the dorsum. Ovipositor reddish, piercer and base distinctly articulated; base somewhat rounding, piercer about equal to it in length; piercer enlarged basally with a constriction between it and the ovipositor base on the upper margin; piercer gradually tapering, extending to about the base of fourth abdominal segment (fig. 75e). Slightly smaller than male.

Length: body, 3.7 mm.; wing, 3.8 mm.

Type locality: Massachusetts.

Type in the Field Museum at Chicago.

The writer has examined the type and has seen specimens from North Beach, L. I., N. Y. 5-24-1924 (F. M. Schott); Highspire, Pa., 4-28 (N. Banks); Sandusky, Ohio, July 18, 1904 (J. S. Hine); Downie Creek, Selkirk Mts., B. C., Aug. 14, 1905 (J. C. Bradley); Hampton, N. H. (S. A. Shaw); Brookline, Mass., May 23 (Johnson); Gloucester, Mass., June 19; Berlin, Mass., Aug. 8, 1915 (C. A. Frost); Auburndale, Mass., May 22, 1904 (Johnson); Barber Dam, N. B., June 25, 1914 (J. D. Tothill) and Lake Tahoe, Calif., Aug. 11, 1940 (D. E. Hardy).

Dorylomorpha occidentis (Hardy)

(Plate 13, figs. 76a-e)

Pipunculus atramontensis occidentis Hardy, 1939, Jour. Kans. Ento. Soc. 12, 17-18. New combination.

This was described as a variety of *atramontensis* (Banks) but upon examining the type of the latter the writer found *occidentis* to be a distinct species. It appears to be related to *atramontensis* but the male hypopygium places it in another group of *Dorylomorpha*. It is easily distinguished by having the antennae black, third segment not so long acuminate (fig. 76a), and hypopygium not so symmetrically developed and with a distinct membranous apical depressed area (fig. 76c). The apical portion of the abdomen is also more swollen from lateral view (fig. 76d) and the specimens are slightly smaller in size. This species differs from *flavomaculata* (Hough) in having the abdomen entirely shining black, femora with black rings, tibiae discolored medianly; hypopygium shorter, not so pointed. From ventral view the membranous portion of the eighth segment occupies a small area at apex; sclerotized portion of eighth much longer than length of ninth segment. Ninth about as broad as long, the cleft on the hind margin is "U" shaped and extends about one third the length of the segment. Harpagones irregular, their apices produced bootlike toward the right (fig. 76e).

Length: body, 3.5-3.7 mm.; wings, 4.5-4.7 mm.

Female unknown.

Type locality: Potlatch, Idaho.

Type in United States National Museum.

Dorylomorpha ornata n. sp.

(Plate 13, figs. 77a-f)

This species is related to *exilis* (Mall.) by external characters. The abdomen is more strongly swollen and the sixth abdominal ter-

gum is greatly developed and forms a receptacle for the harpagones. The harpagones are strongly flattened laterally; the outer harpagone is greatly curved downward and the inner is very irregular in shape but not so curved. The females are related to *tridentata* n. sp. but are distinguished by the long acuminate third antennal segment, more blackened legs, stronger dorsocentral hairs and the long dorsal bristles on the hind tibiae. The females are distinguished from *exilis* by the strongly flattened ovipositor.

Male. Head: Eyes widely separated on the front; front about as wide as ocellar triangle; polished black on upper two thirds, silvery below; front with a longitudinal convexity down its middle; antennae black, bristles of second segment weak, third segment very long acuminate (fig. 77a); occiput broad on upper portion, about one third as wide as the compound eye; face slightly convex, mouthparts yellow. *Thorax:* Polished black in ground color, dusted with brownish pollen on the dorsum, lightly grayed on sides and metanotum; dorsocentral and marginal hairs rather strong and yellow; humeri black, halteres bright yellow. *Legs:* Chiefly black, apices of femora, bases and apices of tibiae and first three subsegments of tarsi yellow; femora moderately developed, with only weak bristles, hind tibiae gently arcuate slightly enlarged toward the apices and with numerous strong yellow hairs on dorsal surfaces near middles. *Wings:* Darkly iridescent; hairs along costal margin rather strong. Third costal section one fourth to one fifth the length of fourth; fifth section longer than third and fourth combined; crossvein r-m situated at about basal one fifth of discal cell, ultimate section of fourth vein slightly curved. Abdomen polished black. *Hypopygium:* The sixth tergum is strongly developed, about equal in size to the eighth segment, the inner margin is produced into a large concave lobe upon which the harpagones rest in normal position. The posterior margin of the lobe possesses two fingerlike projections. The seventh tergum is more narrow and ends in an acute point on its inner margin (fig. 77c). The eighth segment has a large membranous depression at its apex, from ventral view this extends about as wide as long with a shallow "V" shaped cleft on hind margin. Harpagones about equal to the ninth segment in length, very asymmetrical and irregular (fig. 77d, e); both are strongly compressed laterally; the outer is developed into two main lobes and strongly curved downward at its apex (fig. 77b); the inner harpagone has a number of small projections on both inner and outer margins. Cerci very small, not greatly developed.

Length: body, 3 mm.; wing, 4 mm.

Female. Front wider than ocellar triangle, abdomen not so strongly swollen posteriorly as in male. Ovipositor flattened dorso-ventrally. Piercer about equal to length of base with a square topped swelling on underside near base (fig. 77f).

Length: body, 3.7 mm.; wing, 4.5 mm.

Holotype ♂ : Clinton, B. C., June 11, 1938 (J. K. Jacob); allotype and one paratype ♀, same locality and collector as type, June 15, 1938, and one paratype ♀, Chilcotin, B. C., June 18, 1920 (E. R. Buckell).

Holotype, allotype and one paratype returned to Canadian National Museum; others in Snow Entomological Museum.

Dorylomorpha tridentata n. sp.

(Plate 13, figs. 78a-h)

This species is related to *atramontensis* (Banks) in that the hypopygium of the male is symmetrical, with no distinct apical depressed area. It is readily distinguished by having the antennae black, third segment not so long acuminate; femora mostly black, with only apices yellow; third costal section of wing about one third the length of the fourth and ninth segment black instead of yellow as in *atramontensis*.

Male. Almost entirely bare species, thorax and abdomen but sparsely haired. *Head:* Eyes narrowly separated on the front; front silvery on lower one third, shining black on upper two thirds; face silvery pubescent, slightly gibbose on lower portion; mouth-parts yellow, palpi terminating in long slender points; antennae black, hairs of second segment very weak; third segment short acuminate (fig. 78a); occiput cinereous, rather broad on upper portion, narrowed on lower part. *Thorax:* Shining black ground color, mesonotum lightly dusted with brown; dorsocentral hairs present but weak; scutellum mostly polished; propleurae bare; humeri black; halteres bright yellow. *Legs:* Coxae black, trochanters yellow; femora black except for yellow apices; tibiae and tarsi yellow, tibiae sometimes faintly discolored medianly, last two tarsal subsegments yellow-brown; pulvilli slender, as long as tarsal claws; femora slender, spines weak; tibiae straight or nearly so; basitarsi slender, about equal to next four tarsal subsegments. *Wings:* Iridescent; third costal section about one third the length of the fourth; fifth section about one and one half times as long as third and fourth combined; crossvein r-m situated before end of subcostal vein and at basal one sixth of discal cell; last section of fourth vein sinuate;

last section of fifth vein shorter than posterior crossvein; cubital cell with a very short petiole (fig. 78b). *Abdomen*: Polished black, strongly clavate from lateral view (fig. 78c); from dorsal view the sides are almost straight, being but slightly wider at fifth abdominal segment. *Hypopygium*: About three fourths the length of the fifth segment, very slightly compressed to the right and with no apparent depressed area from dorsal view (fig. 78f); the membranous area is very small and seen only in end view. From ventral view a very small membranous portion is visible at the apex of eighth segment. The ninth segment is about as broad as long, with a gibbose swelling on upper outside margin; cleft on hind margin narrowly "U" shaped. Harpagones very irregular, inner one with three strong blunt teeth on outer apical edge; outer elasper broad at base and tapering into a slender fingerlike point (fig. 78d). The sixth tergum is strongly developed (fig. 78g) and gives support to the genital chamber.

Length: body, 3.4-3.6 mm.; wing, 3.6-3.8 mm.

Female: This sex differs in having the eyes more widely separated on the front. The inner margins of the eyes are parallel, the front being as wide as ocellar triangle for its entire length. Bases of hind femora narrowly yellowish. The abdomen is noticeably enlarged posteriorly but not so clavate as in male from lateral view. Ovipositor yellow to yellowish-brown, piercer about equal to its base and distinctly swollen just before the point of articulation, reaching just beyond posterior margin of third abdominal segment; base somewhat elongate from lateral view (fig. 78h), strongly flattened dorsoventrally (fig. 78e). Otherwise like the male.

This species was taken in sedge and swamp grass meadows around the south end of Lake Tahoe. Leafhoppers of the *Thamnotettix* group were present in almost a pure culture and may serve as the host of this Dorilaidae.

Holotype ♂: Lake Tahoe, California, August 2, 1940 (R. H. Beamer). Allotype ♀ same data. Sixty-eight paratypes, fifty-one ♂ ♂, seventeen ♀ ♀, same locality and date (R. H. Beamer, D. E. Hardy, E. E. Kenaga). All deposited in Snow Entomological Collection.

Dorylomorpha uncinata n. sp.

(Plates 13, 14, figs. 79a-g)

This species is related to *cxilis* (Malloch) but the specimens are of larger size; the eyes of the male are narrowly separated on the front; the abdomen is more strongly swollen, the hypopygium is

shorter in proportion to the length of the fifth segment from dorsal view; the membranous area at apex is more elongate and extends almost to anterior margin of eighth segment, the outward projecting apices of the harpagones are narrowly produced dorsoventrally. Apical halves of femora and all of tibiae yellow. Species almost entirely bare, not so densely haired. This species is separable from *caudelli* (Mall.) by the difference in the male hypopygia, membranous area at apex very distinct and no lateral depression, harpagones strongly developed outwardly at apices, shorter ovipositor and more blackened femora and trochanters of the female.

Male. Sparsely haired species. *Head:* Eyes narrowly separated on the front, front shining black on upper two thirds, slightly elevated in the middle portion; bristles of second segment short; third segment long acuminate (fig. 79f), brown to black, tip somewhat yellowish. *Thorax* (and abdomen): Polished black in ground color. thorax dusted with brownish pollen on the dorsum and somewhat grayish on sides. Humeri black, halteres yellow. *Legs:* Coxae chiefly black, apices yellowish; trochanters with a distinct yellowish tinge; femora black except for broad yellow apices; tibiae and tarsi yellow, last subsegments of tarsi faintly brown; femoral spines present on apical halves of middle femora, below; apparently absent on other legs. *Wings:* Iridescent; third costal section of wing one third to one fourth the length of the fourth section; fifth section about equal to fourth; crossvein r-m situated just beyond end of subcostal vein and at about basal one fifth of discal cell; ultimate section of fourth vein slightly curved, last section of fifth much shorter than length of posterior crossvein (fig. 79e). Abdomen typical of the genus. *Hypopygium:* Less than one half the length of the fifth abdominal segment, with a distinct membranous depression extending vertically across the entire tip of eighth segment on right side; this area runs almost to base of eighth segment from dorsal view (fig. 79e). From ventral view the membranous apex of eighth segment is very distinct, covering quite a large area; sclerotized portion of eighth much shorter than ninth segment. Ninth very broad, as wide as long; cleft on hind margin broadly "U" shaped. Harpagones irregular, sides rather straight on basal halves, outside margins strongly curved inward on apical halves; the apices are produced bootshaped on outer edges (fig. 79g).

Length: body, 4-4.6 mm.; wing, 4.3-4.7 mm.

Female. The eyes are widely separated on the front; the frontal stripe is convex in the middle, silvery on lower half, shining black on

upper portion, with a row of pale marginal hairs down each side; occiput very broad on the upper portion, being about four times as wide as the front; antennae brownish in ground color, densely white pubescent and with a long acuminate white point below (fig. 79a). Broad apices of femora, entire tibiae and first four tarsal subsegments bright yellow, legs otherwise black; femora moderately thickened, without noticeable flexor bristles; posterior tibiae swollen apically; posterior basitarsi about equal to the next four tarsal subsegments in length. The ultimate section of the fourth vein (M_{1+2}) is much more sharply curved upward for the first half of its course to the wing apex and the apical cell is more widely open in the margin (fig. 79b). The base of the ovipositor is rather elongate and slightly tuberculate beneath; the piercer is about equal to its base, abruptly tapering and distinctly articulated with its base; tip of piercer extending just beyond apex of segment four (fig. 79d).

Holotype ♂, Fallon, Nevada, Aug. 12, 1940 (D. E. Hardy); allotype ♀ same locality and date (R. H. Beamer). Six paratypes, four ♂♂, two ♀♀ from following localities: Same as type (E. E. Kenaga); Pingree Park, Colo., Aug. 14, 1934, 9200 ft. (C. W. Sabrosky); Austin, Nevada, Aug. 12, 1940 (R. H. Beamer); Ely, Nevada, Aug. 13, 1940 (D. E. Hardy) and Twin Falls, Idaho, Sept. 11-28, 1927-'31 (C. F. Henderson, V. E. Romney).

Holotype, allotype and a series of paratypes in Snow Entomological Collection. One paratype returned to the United States National Museum and one returned to C. W. Sabrosky, Michigan State College.

Tömösváryella Aczel

Tömösváryella Aczel, 1939, Zool. Anzeiger, Band 125, Heft ½, 22-23.

This genus, as defined in this paper, is comprised of those species, formerly of the genus *Dorilas* (*Pipunculus*) which have no stigma in the wing and in which the radio-medial crossvein is situated near the middle of the discal cell. The eyes of the males are contiguous on the front for at least a short distance and the abdomen is not greatly enlarged posteriorly in either sex. The present interpretation of this genus does not include the entire *Tömösváryella* as proposed by Aczel as the subgenus *Dorylomorpha* has been raised to generic rank.

The *Tömösváryella* are perhaps the most highly specialized and most abundant of the DORILAIIDAE. They may be taken in great numbers in most any grassy environment. Most all species show a great deal of resemblance and many cannot be separated except by

use of the male genitalia; these structures usually present the best specific characters.

The hind margins of the eyes are very slightly indented toward the upper portions, so that this part of the occiput is more broadened. The third segment of the antenna is acuminate and rather consistent in shape, usually dark in ground color and covered with fine pale pubescence. The bristles of the second antennal segment are shorter, less pronounced than in most other DORILAIIDAE. The humeri and halteres are consistently yellow and the propleurae bare, without a brush of strong hairs. The dorsum of the thorax has at least sparsely distributed marginal hairs and the dorsocentral hairs are usually distinct. The legs of this group are distinctive and possess some of the best diagnostic characters. The front femora of most species each have a pair of rather strong flexor bristles near their bases; the middle coxae possess several fine to very strong apical hairs or bristles. The trochanters of the hind legs of the males are the most distinctive in appearance, the under sides usually being armed with clumps of hairs, bristles, mounds, ridges or strong toothlike developments according to the species. *T. contorta* (Hardy) is the most unusual member of the genus in that the posterior femora and tibiae of the males are strongly malformed. This contortion is also seen in the females but to a much lesser extent. The tarsi of a good share of the species are flattened and somewhat dilated. This is especially true of the female. The wing venation is rather uniform and offers little in the way of specific characters. The third section of the costa is shorter than the fourth, usually one half or less its length and rarely almost equal to the fourth; fifth section of costa longer than the third and fourth combined. Crossvein r-m at or beyond the end of vein R_{1+2} and rather close to the middle of the discal cell. Ultimate section of fourth vein (M_{1+2}) straight or but faintly curved. The wings are rather short compared to members of other genera, seldom being longer than the body. The sides of the abdomen vary from straight to decidedly rounded, the abdomen usually being widest at about segment three. The pregenital segments (one to five) of the abdomen are normal in position and shape; the sixth segment has been greatly reduced and twisted under, being represented only by a narrow strip extending across the venter, often curving ventrad and giving support to the genital chamber; the seventh segment is likewise reduced to a single sclerite and twisted to the left; it is several times wider than the sixth and occupies the left side of the venter,

its inner margin fitting against the genital chamber. A small portion of the seventh sclerite is usually visible from dorsal view as a small triangular piece on the left side at the base of the eighth segment. The eighth segment forms the greater portion of the visible genitalia; this makes up the broad rounded apical portion of the abdomen. The segment has been completely twisted over via the left side so that the margins come together to form a grooved area longitudinally down the dorsum. The exact position of this junction will vary according to the amount of the twisting which has taken place in the evolution of the species. The membranous portion of the apex usually lies in about the middle of the apical margin and extends more deeply into the segment of the underside than on the dorsum.

Genotype: *Tömösváryella sylvatica* (Meigen) (*Pipunculus*).

The members of this genus are the most difficult to identify of all the DORILAIIDAE and it is necessary to dissect off the terminal portion of the abdomen and study the male genital structures in order to place a good many of the species. Identification of female specimens, for the most part, is very questionable unless accompanied by the male; even then the determination is not always certain because several species of *Tömösváryella* often occur in one environment. It is possible, however, to place them in their related groups and perhaps after the extent of variations have been more thoroughly investigated characters may be used which will place them more correctly.

When making determinations of collections of *Tömösváryella* it is usually necessary to dissect a male of each series in the various groups throughout the genus. These groups are distinguished by external characters, shape of eighth segment, legs, etc.; then the species can be readily separated by the characters of the genitalia proper, the ninth segment, harpagones and cerci as well as the ventral aspects of the seventh and eighth sclerites. The posterior portion of the abdomen may be clipped off with fine dissecting scissors and relaxed in caustic potash, or the genital segments may be removed by carefully picking away the sclerites with a minute needle at about the third to fourth segments depending on the length of the harpagones on the venter. The part may be placed in hot caustic for a few minutes or soaked in cold for an hour or so, then it may be transferred directly to a drop of glycerin for study.

The species *politus* (Williston) referred to the *subvirescens* group by Cresson³⁰ belongs in *Tömösváryella* but cannot be accurately

30. 1911, Trans. Phil. Acad. Sci. 36, 314.

placed as the description is inadequate. The species was described from St. Vincent, West Indies so will not apply to this paper.

KEY TO SPECIES BASED UPON MALES

1. Posterior femora and tibiae strongly contorted (fig. 87c); hypopygium small and densely haired (fig. 87d).....*contorta* (Hardy), p. 157
Legs normal; hypopygium not as above..... 2
2. (1) Hypopygium symmetrical, subhemispherical in shape, not compressed to the left, with the longitudinal suture on the right side (fig. 101b); posterior trochanters each with a conspicuous square topped ridge below, this is densely covered with fine white pubescence (fig. 101a).....*subvirescens* (Loew), p. 178
Hypopygium asymmetrical, compressed to the left, if slightly rounding, the longitudinal suture is well to the left side; hind trochanters without such developments 3
3. (2) Densely gray pollinose species; hypopygium short, somewhat rounding, but little over half the length of the fifth abdominal segment; ninth segment broad, apices developed into acute points; harpagones curved and irregular (fig. 100g).....*subnitens* (Cresson), p. 177
Not with the above combination of characters..... 4
4. (3) Hind trochanters tuberculate below, with moundlike developments of tooth-like processes..... 5
Hind trochanters unarmed except for short hairs or bristles..... 25
5. (4) Hind trochanters each with two teeth or processes beneath (fig. 84c).....*bidens* (Cresson), p. 153
Hind trochanters with only one tooth or tubercle beneath..... 6
6. (5) Posterior femora each with a strong basal tooth beneath; hind tarsi distinctly dilated*appendipes* (Cresson), p. 150
Posterior femora never with more than a small bump near bases..... 7
7. (6) Hypopygium elongate, almost twice as long as wide, tapering to a blunt point from dorsal view..... 8
Hypopygium seldom longer than wide..... 11
8. (7) Apex of eighth segment folded downward (as seen from lateral view); venter of eighth segment with a large membranous depressed area (fig. 86c), apex largely membranous; posterior trochanters with a moundlike tubercle (fig. 86b)*columbiana* (Kertész), p. 156
Not as above; eighth segment straight, sclerotized on venter and only the extreme apex membranous; processes of hind trochanters strongly developed 9
9. (8) Hind trochanters each with a large abruptly curved tooth below (fig. 103b)*torodentis* (Hardy-Knowlton), p. 181
Hind trochanters with large rather square topped developments..... 10
10. (9) Trochanteral process oblique, shining black, slightly pointed on inner edge*quadradentis* n. sp., p. 172
Trochanteral process longitudinal, yellowish in color and square topped.....*sonorensis* (Cole), p. 176
11. (7) Hind trochanters with only moundlike developments, never with elongate or sharply pointed processes..... 12
Processes of hind trochanters acutely pointed or long and slender, never just simple tubercles..... 20
12. (11) Inner harpagone greatly enlarged at apex, both harpagones strongly curved on outer margins 13
Harpagones not greatly enlarged apically, outer edges strongly curved only in *propinqua* 14
13. (12) Hind trochanters with only slightly raised portions below; ninth segment much longer than wide; cleft of ninth extending only about half the length of the segment on a middle line; inner harpagone strongly produced inwardly at apex (fig. 92a).....*longipes* n. sp., p. 147

- Hind trochanters with distinct blunt pointed projections; hypopygium short and rounding; ninth segment wider than long, cleft deeply, the cleft extending to about basal one fourth on middle line; inner harpagone strongly produced on its outer edge (fig. 82a).....*armata* Hardy, p. 152
14. (12) Dorsum of thorax and abdomen densely pale haired; scutellum especially pilose*brevijuncta* n. sp., p. 155
Species with only sparse scattered pile; scutellum bare or nearly so..... 15
15. (14) Cleft of ninth segment very shallow, broadly 'V' shaped; harpagones rounding apically (fig. 109a).....*xerophila* n. sp., p. 188
Ninth segment moderately to deeply cleft on posterior margin; harpagones usually acutely pointed at least on inner apices; harpagones obtuse apically only in *pauca*, which has cleft of ninth tergum extending over two-thirds its length 16
16. (15) Cerci very large, covering the larger part of the harpagone bases; sclerotized portion of eighth segment extending to apex; harpagones divergent toward apices (fig. 105c)*turgida* Hardy, p. 183
Cerci small; sclerotized portion of eighth not extending to apex (from ventral view); harpagones not divergent..... 17
17. (16) Harpagones slender, obtusely rounding at apices (fig. 94b).....*pauca* n. sp., p. 168
Harpagones acute on inner apices, usually rather thick..... 18
18. (17) Harpagones strongly curved on outside margins, outer one bootshaped at apex; both are slender, elongate and rounding apically (fig. 95b).....*propinqua* n. sp., p. 169
Harpagones rather simple, slightly excavated on inner margins, not enlarged apically but somewhat pointed on inner apices..... 19
19. (18) Harpagones without carinae, rather broad and somewhat rounded apically, with a pronounced indentation near base of each harpagone on outside; ninth segment about as long as wide (fig. 104c).....*tumida* Hardy, p. 182
Outer harpagone with a dorsal carina, more slender with no indentations at bases; ninth segment longer than wide (fig. 107e).....*vagabunda* (Knab), p. 185
20. (11) Cerci large, completely covering over the bases of harpagones; processes of hind trochanters long and sharply pointed 21
Cerci normal not obscuring bases of harpagones, if extending beyond apex of ninth segment they are slender, not greatly broadened..... 23
21. (20) Ninth segment very deeply cleft on hind margin, cleft extending almost to base of segment; harpagones large and rounding at apices (fig. 91c); processes of hind trochanters strongly curved on apical halves (fig. 91a).....*floridensis* Hardy, p. 164
Ninth segment broadly 'U' shaped on hind margin; trochanteral tooth straight 22
22. (21) Middle coxae apparently with an elongate spurlike process, above, actually made up of four to five long flat bristles lying so close as to simulate a single development (fig. 108a, 108b), no distinct longitudinal groove on eighth segment*wilburi* (Hardy), p. 187
Middle coxae with two to three narrow, shorter bristles which are distinctly separate; overlapping of eighth segment evident on dorsum.....*utahensis* (Hardy), p. 184
23. (20) Processes of posterior trochanters long and slender but bluntly tipped (fig. 90d); harpagones with an obtuse point on inner edges just below middles, more pronounced on outer harpagone (fig. 90b).....*exilidens* n. sp., p. 162
Processes differently developed; harpagones not as above..... 24
24. (23) Processes sharply pointed and slender, located near apices; outside harpagone broad and blunt, square tipped; inner clasper blunt and slightly curved inward at apex (fig. 89d).....*dissimilis* n. sp., p. 161
Trochanteral processes not so sharply pointed, more thickened; harpagones slender, slightly curved inward and somewhat pointed at apices (fig. 97e),*sachtlebeni* (Aczel), p. 173

25. (4) Base of ninth segment extended to or very near the apex of eighth segment on left side, as seen from ventral view (fig. 88f); hind trochanters each with two to five strong bristles; harpagones rather broad..... 25a. *coquilletti* (Kertész), p. 159
Not as above; eighth segment extending around left side; ninth usually not extending over half way to apex..... 26
25a. Third segment of antennae brown to black.....
.....*coquilletti coquilletti* (Kertész), p. 159
Third segments of antennae yellow.....
.....*coquilletti* var. *flaviantenna* (Hardy-Knowlton), p. 160
26. (25) Harpagones long and slender (fig. 102e).....*sylvatica* (Meigen), p. 180
Harpagones not so shaped..... 27
27. (26) Harpagones produced on outside apices into a pair of sharply pointed incurving lobes (fig. 83b)*beameri* Hardy, p. 153
Harpagones not so developed..... 28
28. (27) Harpagones developed dorsally into strong carinae, very blunt and rounding apically, outer harpagone almost twice as thick as inner...*minacis* Hardy, p. 167
Harpagones without noticeable carinae, somewhat pointed on inner apices.... 29
29. (28) Harpagones greatly enlarged apically, especially inner one; ninth segment elongate, much longer than wide, about twice as long as the sclerotized portion of the eighth on left side, from ventral view (fig. 92c).....
.....*lepidipes* n. sp., p. 166
Harpagones not greatly enlarged at apices; ninth segment broad, about as wide as long, about equal to sclerotized portion on left side..... 30
30. (29) Crossvein r-m situated beyond the middle of discal cell; ultimate section of fourth vein sinuate; ninth segment broadly 'U' shaped on hind margin; harpagones broad, rather blunt at apices (fig. 80b); thorax, abdomen and hypopygium rather thickly haired.....*agnesea* Hardy, p. 149
Crossvein r-m situated before middle of discal cell; ultimate section of fourth vein straight; ninth segment with a 'V' shaped cleft on hind margin, about half its length; harpagones more slender; almost bare species....
.....*similis* (Hough), p. 174

Tömösváryella agnesea Hardy

(Plate 14, figs. 80a-c)

Tömösváryella agnesea Hardy, 1940, Jour. Kans. Ento. Soc., Vol. 13, No. 4, 103-106.

This species is widely scattered over western America and is readily separated by the r-m crossvein being beyond the middle of discal cell, the broad square-tipped harpagones of the male and the large development on the base of the female ovipositor below.

Following is the original description:

"*Male*. Head: Frontal triangle silvery, darker in the middle, upper portion of front shining black; third antennal segment acuminate, brown to black in ground color, densely white pubescent; mouthparts yellowish; compound eyes joined for less than one-third the length of the frontal triangle (fig. 80a). *Thorax* and *abdomen*: Metallic black in ground color but rather densely gray pollinose and more thickly haired than in *similis*; humeri and halteres bright yellow; legs colored as in *similis*, front femora with a pair of flexor bristles near bases; middle coxae with two to three long bristles at their apices; hind trochanters each with a clump of stout short hairs below, these are more numerous but not so long and thin as in *similis*; femora moderately thickened, spines very weak; tibiae almost straight; hind tarsi flat-

tened and dilated. *Wings*: Very faintly iridescent, third section of costa about one-half the length of the fourth; fifth section almost twice as long as third and fourth combined; crossvein r-m situated about half way between the ends of vein R_{1+2} and R_{3+4} and beyond the middle of the discal cell; last section of fourth vein sinuate. Sides of abdomen almost straight, widest at second and third segments; fifth segment but little longer than the fourth. *Hypopygium*: About three-fourths the length of the fifth segment, scarcely compressed to the right, with a large apical depressed area; the longitudinal groove lies slightly to the left due to the longer overfolding of the eighth segment on the right side (lateral view, fig. 80c). From ventral view, in a relaxed condition, the hypopygium is usually quite acutely pointed due to the expansion of the membranous areas at the apex. The ninth sclerite is about as broad as long, with a broadly U-shaped concavity on the hind margin, cleft less than one fourth its length. Harpogones broad and flat, rather square tipped and but slightly hollowed out on the inner margins below (fig. 80b). Aedeagus with two large basal supporting plates attached to ninth sclerite by apodemes.

"Length: body, 3 mm.; wings, 2.7 mm.

"*Female*: The females are for the most part inseparable from *similis* unless accompanied by the males. The upper one-third of the front is shining black; the r-m crossvein is situated at or beyond the middle of the discal cell; the ultimate section of the fourth vein is slightly curved instead of straight, as in *similis* and the body is more pollinose. Posterior tarsi flattened and somewhat swollen, first tarsal subsegment almost equal to the remaining four. Base of ovipositor subglobose, shining black, piercer scarcely longer than base and extending just beyond apex of third segment."

Type locality: Lawrence, Kansas.

Type in the Snow Entomological Collection.

This species is one of the most common western Dorilaid, it is often taken in abundance, in Bermuda grass, Blue grass, Johnson grass, and other like habitats. This species has been identified from numerous localities in the following states: Arizona, California, Colorado, Idaho, Kansas, Nevada, New Mexico, Oregon, Utah and Washington.

Tömösváryella appendipes (Cresson)

(Plate 14, figs. 81a-h)

Pipunculus appendipes Cresson, 1911, Trans. Am. Ent. Soc. XXXVI; 319-320.

This species is very easily recognized by the characters on the posterior legs of the male; the single tooth of process on the trochanters accompanied by a distinct tubercle at the bases of the femora; the posterior tarsi are also strongly dilated.

Male. Chiefly subshining black, almost bare species, with only a few scattered microscopic hairs. Face silvery, front silvery with a faint tinge of yellow; eyes joined for about one half the length of

the frontal triangle; occiput gray below, subshining on upper portion; mouthparts yellowish; third segment of antennae brownish black to brownish with a distinct yellow tinge, densely white pubescent; third segment acuminate below (fig. 81a). *Thorax*: Mesonotum and scutellum only lightly dusted with brown; metanotum subshining medianly, grayed on the sides; pleurae moderately gray pollinose; humeri and halteres yellow; legs chiefly black, apices of femora and tibiae, bases of tibiae and first four tarsal subsegments yellow; femora moderately thickened, flexor bristles very weak; posterior trochanters with an elongate, blunt, slightly curved tooth-like process below near their apices in the typical form; this varies somewhat and some specimens have just an acute tubercle (figs. 81b, 81d, 81h); hind femora with a distinct tubercle on undersides near bases; posterior tibiae almost straight; hind tarsi flattened and dilated, wider than the tibiae; basitarsi about equal in length to the next four subsegments (fig. 81b). *Wings*: Third section of costa about one half the length of the fourth, fifth section about twice as long as the third and fourth combined; crossvein r-m situated just before the middle of the discal cell and beyond end of R_{1+2} ; last section of fourth vein with but a slight curvature, much longer than the third section of that vein (fig. 81c). *Abdomen*: Shining, metallic black, dusted with gray only faintly on the first tergum; sides slightly rounding, widest at segments three and four; fifth segment about one third longer than the fourth. Hypopygium about three fourths the length of the fifth segment, faintly pollinose, asymmetrical, with a median cleft formed by the edges of the eighth tergum coming together on the dorsum. The harpagones are asymmetrical, the one on the inner side being much thicker and larger than the outer clasper; harpagones rather elongate, curved and pointed on inner sides at apices, inner margin somewhat hollowed out, concave (fig. 81e).

Length: Body 2.4-3.0 mm.; wings 2.2-2.8 mm.

Female. The females fit near *similis* (Hough) but can usually be separated by the entirely shining abdomen, dilated hind tarsi and differently shaped ovipositor. The front is wider than the face and depressed medianly; shining black on upper one third, silvery on lower portion. Base of ovipositor globose, piercer long and slender, extending almost to the apex of the second segment (fig. 81g). Otherwise like the male.

Length: body and wings, 2.5-3 mm.

Type locality: Summerville, South Carolina.

Type No. 5032 in Philadelphia Academy of Science.

This species is very widely distributed; specimens have been identified from the following states: California, Colorado, Florida, Illinois, Iowa, Kansas, Louisiana, Nevada, North Carolina, Ohio, Oklahoma, Tennessee, Utah, Vermont, and Virginia.

Tömösváryella armata Hardy

(Plate 14, fig. 82a-b)

Tömösváryella armata Hardy, 1940, Jour. Kans. Ent. Soc. 13, 106-107.

Following is the original description:

"This species belongs to the *vagabunda* group by having the hind trochanters of the male armed with tubercles; the shape of these developments and the male genital characters will distinguish it from all other species.

"*Male*. Rather sparsely haired species, dorsocentral hairs present and also scattered marginal hairs on mesonotum, scutellum and abdomen. *Head*: Face and frontal triangle silvery, the latter slightly darker; front shining black above junction of eyes; eyes joined for more than half the length of the frontal triangle; antennae black, third segment acuminate. *Thorax and abdomen* subshining black in ground color rather densely brownish pollinose; grayed on the margins, pleurae and metanotum. *Legs*: Femora moderately thickened, flexor spines weak; front femora with one or two rather weak flexor bristles near bases, middle coxae with three to four moderately strong black apical bristles; hind trochanters comparatively short in length, each with a distinct obtuse carina or tubercle just beyond the middle below (fig. 82b); this tubercle is thickly covered with microscopic white pile; hind tibiae slightly curved, tarsi flattened; basitarsi longer than the next three subsegments. *Wings*: Very lightly iridescent, third costal section about half the length of fourth section; fifth section about twice the length of third and fourth combined; crossvein r-m situated much beyond the end of vein R_1 (R_{1+2}) and at middle of discal cell; ultimate section of fourth vein about straight; last section of fifth shorter than posterior crossvein. Sides of abdomen somewhat rounding, fifth segment about one third longer than fourth. *Hypopygium*: Rather symmetrical, broadly rounding, about three fourths the length of the fifth segment, only slightly compressed to the right with a broad longitudinal groove medianly and a distinct apical depression. Ninth segment about as broad as long, with a 'V' shaped cleft apically about three fourths of its length on median line. Harpagones asymmetrical, inner clasper greatly enlarged at apex with a large rounding lobe on right side, from ventral view; outer clasper enlarged at apex but not so developed (fig. 82a).

"Length: body, 3 mm.; wings, 2.8 mm.

"*Females*. The females associated here have the upper one third of the front shining with a narrow black stripe extending down into the silvery area; the hind trochanters are unarmed except for a few pale hairs below; the tarsi are more flattened and dilated. The base of the ovipositor is globose, the piercer about twice its length and gradually tapering at base; piercer extending to apex of second abdominal segment."

Type locality: Griffin, Georgia.

Type in the Snow Entomological Collection.

Tömösváryella beameri Hardy

(Plate 14, figs. 83a-b)

Tömösváryella beameri Hardy, 1940, Journ. Kans. Ent. Soc. 13, 107.

Following is the original description:

"This species is related to *similis* (Hough) but the male genitalia are very distinctive. The specimens are also smaller in size.

"*Male*. Fitting the description of *similis* in most details. The eyes are joined for less than one third of the length of the frontal triangle and the front is silvery above the junction of the eyes. The thorax and abdomen are more distinctly pollinose and more thickly haired. The dorsocentral hairs rather strong. Posterior trochanter with just a few inconspicuous short hairs, and distinctly carinated beneath (fig. 83a). Posterior basitarsi longer than next four tarsal subsegments; hind tarsi flattened. Wings more hyaline, very slightly milky. Hypopygium like *similis* in dorsal view, from ventral view the ninth segment is much longer than wide, equaling the eighth in length, with a V-shaped cleft on apical margin, extending over one-third its length. Harpagones very irregular, almost symmetrical, with their posterior lateral margins strongly produced into a pair of sharply pointed incurving lobes (fig. 83b); inner clasper slightly longer than the outer.

"Length: body, 2.1-2.3 mm.; wings, 2.2 mm.

"*Female*. Differs from *similis* in having the piercer of the ovipositor about twice as long as base and extending beyond the apex of the second segment. The posterior basitarsi are short and very flat, scarcely as long as the next three tarsal subsegments in length."

Type locality: Douglas County, Kansas.

Type in Snow Entomological Collection.

Added distribution: Glasco, Kansas, Aug. 24, 1940 (L. C. Kuitert, L. J. Lipovsky); Downs, Kansas, Aug. 24, 1940 (R. H. Beamer); Clay Center, Kansas, Aug. 24, 1940 (R. H. Beamer, L. C. Kuitert) and Walnut, Kansas, Aug. 31, 1940 (R. H. Beamer).

Tömösváryella bidens (Cresson)

(Plate 14, figs. 84a-f)

Pipunculus bidens Cresson, 1911, Trans. Amer. Ent. Soc. XXXVI, 320.

This species is easily recognized by two appendages on each posterior trochanter of the male.

Male. Small chiefly bare species, with only scattered pale hairs on thorax and abdomen. *Head*: Face silvery, frontal triangle lightly golden tinged, upper part of front and vertex shining black; occiput gray on the sides, subshining black on upper portion; eyes joined on the front for about one half the length of the frontal triangle; antennae brown to black, third segment with a faint yellowish tinge in ground color, densely white pubescent and acuminate pointed below (fig. 84a). *Thorax*: Mesonotum and scutel-

lum shining black, lightly brown dusted; metanotum and pleurae faintly gray; humeri and halteres yellow. Legs chiefly black, apices of femora and tibiae, bases of tibiae and first four tarsal subsegments yellow, last joint of tarsi brown; femora moderately thickened, flexor spines weak; front femora with two well developed flexor bristles near bases; middle coxae with two to three long bristles at apices above; hind trochanters each with a pair of elongate projections on undersides, one on the outer ventral margin just below the base and the other on the inner ventral margin just below the apex of the segment (fig. 84c); hind tarsi slightly flattened and dilated, posterior basitarsi equal to the next four subsegments in length. *Wings*: Third costal section about one third the length of fourth; fifth section over two times the length of third and fourth sections combined; crossvein r-m situated beyond the end of vein R_{1+2} , just before middle of the discal cell; last section of fourth vein slightly curved (fig. 84b). *Abdomen*: Shining metallic black, very faintly dusted; sides almost straight, slightly wider at segments two and three; fifth segment one third longer than the fourth. *Hypopygium* very similar to *appendipes*, scarcely any notable difference; the longitudinal cleft is usually slightly more to the right and a more distinct apical depression is visible (fig. 84d). The harpagones are similar to *appendipes* (Cresson), with the inner clasper more developed than the outer (fig. 84f).

Length: body, 2.8 mm.; wings, 2.3-2.5 mm.

Female. The female is very similar to *appendipes* (Cresson) and *similis* (Hough) and is difficult to separate without association of the male. The frontal stripe is very broad, widest in central portion and sunken in medianly. The front is almost entirely cinereous with only a small shining black portion above near vertex. Posterior trochanters armed with several strong hairs beneath. Base of ovipositor subglobose, piercer slender, reaching to about the apex of second segment in normal position (84e).

Length: body 2.8 mm.; wings, 2.3-2.5 mm.

Type locality: Yosemite Valley, California.

Type No. 5031 in Philadelphia Academy of Science.

The writer has examined the type series and has a series of homotypes and a large series of topotypes, Aug. 1, 1940 (R. H. Beamer, L. C. Kuitert, D. E. Hardy). The species is widely distributed, having been collected in México and from numerous localities in the following states: California, Florida, Kansas, New Mexico, and Oklahoma.

Tömösváryella brevijuncta n. sp.

(Plate 15, figs. 85a-f)

This species is related to *agnesea* Hardy and to *vagabunda* (Knab); it differs from both of these in being densely pale haired on the dorsum of the thorax and abdomen, scutellum especially hairy; the strong development on the hind trochanters, much more pronounced than in *vagabunda*. It is of much larger size than *vagabunda*, the r-m crossvein is situated beyond the middle of the discal cell; the eighth segment does not overlap past the median portion from dorsal view and the longitudinal membranous area is wide and distinct. The harpagones are not carinated and are more strongly curved on outer margins; these are more slender and curved than in *agnesea* and the cleft of ninth segment is deeply 'V' shaped. The females fit near *agnesea* by the position of the r-m crossvein; they are best separated by the hairiness of the dorsum and the shape of the ovipositor base.

Male. Head: Eyes joined for only a short distance on the upper portion of the front; junction about equal to the length of ocellar triangle, portion of front above junction shining black, lower part silvery pubescent; bristles of second antennal segment weak, third segment brownish with slight tinge of yellow; subacuminate below; first two subsegments of arista yellowish. *Thorax:* Margins and most of posterior portion of mesonotum thickly covered with long yellow hairs; dorsocentral hairs strong; scutellum and humeri very densely haired; humeri and halteres yellow; metanotum with a distinct transverse grooved area. *Legs:* Chiefly black, extreme apices of femora and tibiae, bases of tibiae and first four subsegments of tarsi yellow; ultimate tarsal subsegments brownish; front femora with no apparent flexor bristles at bases; apical hairs of middle coxae moderately slender and yellow; process of hind trochanter large and rounding, densely covered with pale pile; produced as long as the width of the trochanter at base (fig. 85e); hind tibiae slightly arcuate; basitarsi about equal to next three tarsal subsegments in length. *Wings:* Lightly iridescent, third section of costa about one half the length of the fourth; fifth section almost twice as long as third and fourth combined. Crossvein r-m situated just beyond middle of discal cell and well beyond end of first vein (R_{1+2}); last section of fourth vein slightly curved; last section of fifth shorter than length of posterior crossvein and becoming faint near the wing margin. Sides of abdomen almost straight, slightly widest at segments two to three. Fifth abdominal segment

almost twice as long as fourth. *Hypopygium*: About three fourths the length of the fifth segment. Longitudinal membranous area median in position, broad and very distinct; seventh sclerite scarcely visible from dorsal view (fig. 85c). From ventral view the membranous area is very extensive, covering the entire apex; sclerotized portion of eighth on left side much shorter than ninth segment. Ninth segment slightly longer than broad, cleft on hind margin deeply 'V' shaped extending half the length of the segment. Harpagones strongly curved, inner margins concave. Cerci slender, not greatly enlarged, extending just beyond apex of ninth segment (fig. 85d).

Length: body, 3.6-3.8 mm.; wing, 3.4 mm.

Female. Front broad, slightly concave longitudinally, silvery gray pollinose to the ocellar triangle. Front femora with a pair of small, black, flexor spines near bases below. Posterior trochanters somewhat swollen below, with a clump of fine yellow hairs (fig. 85f), no projection as in male. Base of ovipositor subglobose, piercer slender, about twice as long as base (fig. 85b) and extending beyond posterior margin of second abdominal segment. Otherwise like the male.

Holotype ♂: Palm City, California, July 19, 1940 (R. H. Beamer); allotype ♀, same locality and date (D. E. Hardy). Sixteen paratypes, nine ♂♂, seven ♀♀, same locality and date (R. H. Beamer, D. E. Hardy, E. E. Kenaga). All are in the Snow Entomological Collection.

The type series was taken sweeping in a large salt grass and clump grass meadow. Leafhoppers of the genus *Parabolocratrus* were by far the most abundant and possibly serve as host for this species.

Tömösváryella columbiana (Kertész)

(Plate 15, figs. 86a-d)

Pipunculus columbianus Kertész, 1915, Ann. Mus. Nat. Hungar. 13, 386.

Pipunculus trochanteratus Malloch, 1913, Proc. U. S. Nat. Mus. 43, 297-298.

Tömösváryella columbiana (Kertész) is a change of name as *trochanteratus* was first used by Becker to designate an Egyptian species, 1900, Ent. Zeitschr. XIV; 221.

Examination of the type of *trochanteratus* Malloch (nec Becker) proved it to be very different from that species which has previously been placed here. It is distinctive from all other species in the complex by the unusual development of the male hypopygium and the shape of the trochanteral tubercle.

Male. Face and frontal triangle silvery, front above junction of

eyes shining; eyes joined for less than one half the length of the frontal triangle; antennae yellow-brown to blackish in ground color, third antennal segment long acuminate (fig. 86a); vertex and upper occiput shining to subshining, lower occiput gray pruinose. *Thorax*: Mesonotum subshining, covered with brownish pollen, pleurae and metanotum silvery to gray, humeri and halteres yellow. *Legs*: Chiefly brown to black, apices of femora and tibiae, bases of tibiae and first four tarsal subsegments, yellow. Hind legs somewhat contorted, femora rather strongly swollen, tibiae swollen medianly and arcuate; posterior trochanters each with a large blunt, almost square tipped process beneath (fig. 86b). *Wings*: Lightly iridescent; third costal section one third to one half the length of the fourth; crossvein r-m situated at about middle of discal cell and beyond end of vein R_{1+2} ; ultimate section of fourth slightly curved, last section of fifth much shorter than posterior crossvein; cubital cell with a rather long petiole. *Abdomen*: Subshining, only lightly dusted, sides faintly cinereous, more so on fifth tergum; sides of abdomen almost straight. *Hypopygium*: Very distinctive, lightly gray dusted, produced apically into an elongate bluntly pointed process which folds downward just beyond middle; it is possible that this folds up into the depressed area on the venter of the hypopygium in normal position; this folding is toward the left side (fig. 86c). The long terminal portion is thickly covered with fine yellow pile and is largely membranous; a longitudinal ridge runs down the middle of the hypopygium above (fig. 86d).

Length: 2.5 mm.

Female unknown.

Type locality: Kaslo, British Columbia.

The above description is based upon the type in the United States National Museum.

Tömösváryella contorta (Hardy)

(Plate 15, figs. 87a-g)

Pipunculus contortus Hardy, 1939, Jour. Kans. Ent. Soc. V. 12, No. 1, pp. 18-19.

This is distinctive from all other known species in the family by the abnormally malformed posterior legs of the male and the peculiarly developed hypopygium.

The following is the description of the male altered slightly from the original:

Male. Head: Face silvery pubescent, front golden, subshining black in ground color. Eyes contiguous for only a short distance on the upper part of the front, joined for only a fraction of the length

of the front. Sides of occiput silvery pollinose, upper portion and vertex subshining black. Third antennal segment short acuminate (fig. 87a), brownish in ground color. "Thorax and abdomen: Lightly gray pollinose, but slightly shining and covered with very fine, short brownish pubescence. Pleurae, metanotum and sides of abdomen more conspicuously grayed. Humeri and halteres bright yellow. *Legs*: Chiefly black except for extreme apices of femora and tibiae, broad bases of tibiae and first two tarsal segments which are yellow; other tarsal segments brown to black. Femoral spines very weak." Posterior femora and tibiae strongly contorted, post-trochanter with a well developed tubercle beneath (fig. 87c), tarsal subsegments of hind legs flattened. "Wings: Hyaline, without stigma. Third costal section short, about one third to one fourth the length of the fourth section. Cross-vein r-m situated at the middle of the discal cell, just beyond the middle of the fourth costal section. Last section of fourth vein slightly sinuate; ultimate section of fifth vein equal in length to the posterior crossvein. Petiole of cubital cell long." Sides of abdomen somewhat rounding, broadest at segments two and three; segment five about one and one third times as long as four. *Hypopygium*: Rather small and rounding, about one third as long as fifth segment, densely brown to black haired, eighth segment especially hairy on left side (fig. 87f). Hypopygium scarcely compressed to the right and with a median depression formed by the coming together of the margins of the eighth tergum (fig. 87d). Ninth segment yellow-brown, with a 'V' shaped cleft extending about half its length on a middle line. Harpagones slender, slightly enlarged and hooked inward at their apices; almost symmetrical, inner clasper slightly longer than outer (fig. 87g).

Length: body, 3-3.5 mm.; wings, 3.5-4 mm.

Female. The females are separable from other *Tömösváryella* by the thickened hind femora, arcuate and thickened tibiae (fig. 87b). Front silvery on lower two thirds, shining black on upper one third, below ocelli; front concave longitudinally, strongly indented between the eyes. Base of ovipositor somewhat rounding, piercer slender, slightly longer than its base and reaching to posterior margin of the third abdominal segment (fig. 87e). Otherwise like the male.

Type locality: Douglas County, Kansas.

Type at Kansas State College.

This species is widely distributed, although is more common in the middle west. The writer has a large series of topotypes (R. H.

Beamer, D. E. Hardy) also specimens from numerous localities in the following states: California, Colorado, Georgia, Kansas, Minnesota, and Nevada; also Manitoba.

Tömösváryella coquilletti (Kertész)

(Plate 15, figs. 88a-g)

Pipunculus coquilletti Kertész, 1907, Ann. Musei Nationalis Hungarici, v. 582.

Pipunculus proximus Cresson, 1911, Trans. Amer. Ent. Soc. XXXVI, 318-319.

This species has been unrecognizable from the original description, from which it would seem to be unique from all other *Tömösváryella* in having the hypopygium compressed to the left. This is not actually the case. Examination of the type in the Hungarian National Museum and comparison with homotypic specimens of *proximus* proved them to be conspecific.

Tömösváryella coquilletti is one of the most easily distinguished of the similis group. It can be recognized by strong bristles on the posterior trochanters and the distinctive hypopygium of the male. It is apparently one of the most common American species in this complex.

Male. Face and frontal triangle silvery, front above junction of eyes shining black, as is the vertex; eyes joined for less than half the length of the frontal triangle; third segment of antennae brownish to black, rather slender and long, white, acuminate below (fig. 88a), bristles of second segment very weak. *Thorax and abdomen:* Shining black in ground color, very faintly brownish to gray dusted; metanotum, parts of pleurae and first abdominal tergum lightly cinereous, sternopleurae entirely shining; humeri and halteres yellow; dorsocentral and marginal hairs distinct on mesonotum, body otherwise sparsely haired. *Legs:* Chiefly black, apices of femora and tibiae, bases of tibiae and first four tarsal subsegments yellow, last subsegment brown, front femora with a pair of rather strong flexor bristles near bases; mid-coxae with patches of strong, downward projecting bristles on their apices; posterior trochanters each with two to several strong bristles on undersides (fig. 88d); femora moderately thickened, bristles rather well developed beneath on apical one third; posterior tibiae slightly curved; basitarsi about equal in length to next three tarsal subsegments. *Wings:* Faintly iridescent, the third section of costa about one third the length of the fourth, fifth section about twice as long as third and fourth combined; fork of Rs situated before the arcus; crossvein r-m located about half way between the ends of veins R_{1+2} and R_{3+4} and just before the middle of the discal cell; ultimate section of fourth

vein slightly curved (fig. 88b). *Abdomen*: With a faint metallic luster, sides slightly rounded, widest at segment three; fifth segment scarcely one third longer than the fourth. *Hypopygium*: About three fourths the length of the fifth segment, compressed to the right, asymmetrical, with an apical depressed area and a longitudinal groove on the right side as viewed from above (fig. 88g). Hypopygium very often extended so that the ninth segment is plainly visible on the right side and the seventh tergum on the left side, from dorsal view. From ventral view the hypopygium is very characteristic, the ninth segment is elongate, longer than the eighth in length, its anterior margin almost reaching to the membranous area at the apex of the eighth; ninth segment with a deep 'V' shaped cleft on posterior margin and a distinct longitudinal groove down the middle. Harpagones simple, gently curved on inner margins and bluntly pointed (fig. 88f).

Length: body and wings 3-3.5 mm.

Female. Front chiefly silvery, shining on the upper one third, subshining in the middle; post-trochanter with four to five strong bristles beneath. Ovipositor rather slender, reaching beyond apex of the second abdominal segment; base subglobose, piercer longer than base (fig. 88e); otherwise like the male.

Type locality: Adirondack Mountains, New York.

Type in Hungarian National Museum.

This species is very widely distributed. The writer has studied the type of *proximus* at the Philadelphia Academy of Science and has identified specimens from the following states and provinces: British Columbia, California, Colorado, Connecticut, Florida, Idaho, Illinois, Iowa, Kansas, Maine, Massachusetts, Michigan, Minnesota, Nebraska, Nevada, North Carolina, New Hampshire, New Jersey, New York, Nova Scotia, Oklahoma, Pennsylvania, Quebec, Rhode Island, South Carolina, South Dakota, Texas, Utah, Vermont, Virginia, Washington and Wisconsin; also Alaska.

Tömösváryella coquilletti var. *flaviantenna* (Hardy-Knowlton).

Pipunculus proximus var. *flaviantennus* Hardy-Knowlton, 1939, Ann. Ento. Soc. Amer. XXXII; 118.

This might better be considered a western subspecies; it differs from the typical form in having the third antennal segment yellow, the ovipositor of the female more slender, reaching almost to base of the abdomen and the abdomen of the male narrower; sides almost straight, not so rounding as in *coquilletti coquilletti* (Kertész).

Type locality: Smithfield, Utah.

Type is at the United States National Museum.

This subspecies has been recorded from Idaho, Utah and Washington.

Tömösváryella dissimilis n. sp.

(Plates 15 and 16, figs. 89a-e)

This species belongs in the *sachtlebeni-utahensis* group by possessing an acute development on hind trochanter, and it is distinguished from all other known species by the broad, bluntly tipped harpagones and small cerci.

Male. Small almost entirely bare species. *Head:* Eyes joined for about one third the length of the front; frontal triangle silvery; bristles of second antennal segment weak; third segment rather long, acuminate (fig. 89e) dark brown in ground color, tip and clothing pubescence yellowish; basal two sections of arista with a faint yellowish tinge. *Thorax:* Polished black in ground color, pleurae and metanotum gray, mesonotum and scutellum lightly dusted with brown, grayish pollinose on the sides; humeri and halteres yellow. *Legs:* Chiefly black, extreme apices of femora and tibiae, bases of tibiae and first four tarsal subsegments yellow; femoral spines distinct but weak; front femora each with a pair of weak pale flexor bristles near bases below; middle coxae with moderately strong apical bristles above; process of the hind trochanter acutely pointed, situated near apex of segment (fig. 89a); posterior basitarsi slightly dilated, a little longer than the next three tarsal subsegments. *Wings:* Rather typical, third costal section about half as long as fourth; fifth section one and one half as long as third and fourth combined; crossvein r-m situated just beyond end of vein R_{1+2} and before middle of discal cell; ultimate section of fourth vein slightly sinuate. *Abdomen:* Polished black, only faintly dusted; sides slightly rounding, widest at segments three to four; fifth abdominal segment about one third longer than fourth. *Hypopygium:* Almost equal to the fifth segment in length; seventh segment scarcely visible from dorsal view. Eighth segment with a median longitudinal depressed area formed by the extensive membranous portion (fig. 89e). From ventral view the large membranous apex extends over half the distance from the apex to the base of the ninth segment. Ninth slightly longer than wide and longer than sclerotized portion of eighth segment on left side. Apical cleft broadly 'V' shaped, extending more than half the length of segment on middle line. Harpagones broad and blunt, outer harpagone being the thicker and shorter of the two (fig. 89d). Cerci

narrow, extending beyond apex of ninth segment but not greatly developed.

Length: body, 2.5-2.7 mm.; wings, 2.5 mm.

Female. The females associated here have the front entirely silvery; flexor bristles of front femora strong; hind trochanters unarmed except for a few scattered pale hairs. Base of ovipositor shining black, almost globose in shape; piercer but little longer than base, thickened and gradually tapering from base (fig. 89b), extending beyond posterior margin of third abdominal segment. Otherwise like the male.

Holotype ♂; Sunnyside Canyon, Huachuca Mountains, Arizona, July 9, 1940 (R. H. Beamer); allotype ♀ same data. Twenty-three paratypes; nine ♂♂, four ♀♀, same locality and date as type (R. H. Beamer, D. E. Hardy); three ♂♂ Chiricahua Mountains, Arizona, July 4, 1940 (R. H. Beamer, D. E. Hardy); five ♂♂, Arivaca, Arizona, July 12, 1940 (R. H. Beamer, D. E. Hardy) and two ♂♂, Mountain Park, New Mexico, July 4, 1940 (R. H. Beamer). All are in the Snow Entomological Collection.

Tömösváryella exilidens n. sp.

(Plate 16, figs. 90a-d)

This species is related to *utahensis* (Hardy-Knowlton) but is easily separated by the long slender, bluntly tipped trochanteral process, the small cerci and the developments on the inner margins of harpagones. The membranous apex of the eighth segment is greatly expanded and the cleft of ninth extends more than half the length of segment on a middle line.

Male. Small chiefly bare species. *Head:* Eyes joined for only a short distance on the front, the junction scarcely longer than the length of ocellar triangle; frontal triangle with a faint longitudinal groove running its length down the middle; front and face silvery pubescent; antennae black, bristles of second segment weak, third segment acuminate, fitting figure of *dissimilis* (fig. 89c). *Thorax:* Subshining in ground color, rather thickly dusted with brown on dorsum, grayed on the pleurae and sides of mesonotum; metanotum with a faint transverse groove near upper margin, cinereous above and subshining on lower portion; humeri and halteres yellow; anterior lateral margins of mesonotum with a row of strong yellow hairs, dorsocentral hairs present but rather weak. *Legs:* Typical in coloration except for a brownish tinge to all the tarsal subsegments; front femora each with a pair of rather strong yellow bristles near bases below; mid-coxae with moderately strong dark bristles

at their apices; process of hind trochanter long, slender, slightly enlarged and blunt at apex (fig. 90d); this development is about equal to the width of the trochanter and situated just beyond the middle of the segment below. *Wings*: Third costal section about one third the length of the fourth, fifth section twice as long as third and fourth combined; crossvein r-m situated before the middle of discal cell and just beyond apex of vein R_{1+2} ; ultimate section of fourth vein very slightly curved; last section of fifth a little shorter than length of posterior crossvein; petiole of cubital cell elongate. *Abdomen*: Metallic black in ground color, lightly dusted with gray; sides rounding, widest at segments three to four. *Hypopygium*: Almost as long as fifth abdominal segment, the membranous portions being quite distended at apex and extending basally just to the left of a median line (fig. 90a). From ventral view the greatly extruded membranous apex is more plainly visible. The ninth segment is about as wide as long and is scarcely longer than the sclerotized portion of the eighth segment on left side. The cleft of ninth segment is 'V' shaped and rather deep. Harpagones quite broad, with outer margins nearly straight; the inner margins are rather strongly curved on apical portions, produced into blunt lobes just below middles; apices blunt but slightly pointed on inner margins. Cerci small and slender, scarcely extending past posterior margin of ninth segment (fig. 90b).

Length: body 2.2-2.5 mm; wings, 2.3 mm.

Female. The female specimens that have been associated have a yellowish tinge to the third antennal segment; front entirely silvery, very broad, much wider in the middle than at antennae and somewhat concave. Bristles of front femora and middle coxae much stronger than in the male; hind trochanters slightly swollen beneath but armed only with a few pale hairs. Hind femora with several rows of strong yellow hairs. Base of ovipositor shining black, subglobose; piercer slender, longer than its base (fig. 90c) and extending about to anterior margin of third abdominal segment. Otherwise like the male.

Holotype ♂, Sunnyside Canyon, Huachuca Mountains, Arizona, July 9, 1940 (D. E. Hardy); allotype ♀, same data as type. Twenty-eight paratypes; three ♂♂, one ♀, same locality and date as type (R. H. Beamer, D. E. Hardy); four ♂♂, Yosemite National Park, California, Aug. 1, 1940 (R. H. Beamer, D. E. Hardy); one ♂, Lake Tahoe, California, August 11, 1940 (R. H. Beamer); eleven ♂♂, two ♀♀, Moriarty, New Mexico, June 24, 1940 (R. H. Beamer, E. E. Kenaga, L. J. Lipovsky, D. E.

Hardy); three ♂♂, one ♀, Estancia, New Mexico, June 24, 1940 (D. E. Hardy); one ♂, Clouderoft, New Mexico, June 27, 1940 (R. H. Beamer) and one ♂, Mountain Park, New Mexico, June 27, 1940 (D. E. Hardy). All are in the Snow Entomological Collection.

Tömösváryella floridensis Hardy

(Plate 16, figs. 91a-c)

Tömösváryella floridensis Hardy, 1940, Journ. Kans. Ent. Soc. 13, 109-110.

Following is the original description:

"This species is related to *toxodentis* (Hardy-Knowlton), the two are readily separated by comparing the toothlike developments of the posterior trochanters and the male hypopygia.

"*Male*. Almost entirely black, sparsely pilose species. *Head*: Antennae yellow-brown to brown, third segment long acuminate, first two sections of the arista pale; eyes joined on upper portions of front for about one-half the length of the frontal triangle; face silvery pubescent; front, below the junction of the compound eyes, faintly gray to silvery; upper portion of front and vertex shining black; occiput subshining, only faintly gray dusted above, cinereous on the sides and lower portion; posterior margin of eyes slightly indented on upper half so that the portion of the occiput above is more swollen. *Thorax and abdomen*: Shining metallic black in ground color, very faintly dusted; pleurae and metanotum more grayish, sternopleurae shining on lower portions, humeri and halteres bright yellow; legs chiefly black, apices of femora and tibiae, bases of tibiae and first four tarsal subsegments yellow; femora moderately thickened, with two rows of strong spines on apical halves below; anterior femora each with two long flexor bristles near bases below; middle coxae with a transverse row of long slender, downward directed bristles at their apices, above; posterior trochanters each with a distinctively shaped tooth-like projection on undersides near apices; this tooth directs downward for about half its length then abruptly narrows and slants toward the base of the trochanter (fig. 91a); tibiae almost straight, only slightly bowed; basitarsi equal in length to the next three tarsal subsegments. *Wings*: Hyaline, very faintly iridescent, third section of costa little less than one-half the length of the fourth; fifth costal section twice as long as third and fourth combined; crossvein r-m situated at or slightly beyond the end of vein R_1 (R_{1+2}) and just before the middle of the discal cell; last section of fourth vein (M_{1+2}) slightly curved, longer than the third section of that vein (from r-m crossvein to m); posterior crossvein (m) longer than last section of the fifth vein. *Abdomen*: Sides but gently rounding, widest at segments two to four; the posterior portion of the abdomen is strongly bent downward. Fifth abdominal segment longer than the fourth, hypopygium about equal to the fifth in length. *Hypopygium*: With a distinct vertical keel at apex, above and a large median cleft area extending from the base almost to the keel from dorsal view (fig. 91b). The apical portion of the hypopygium is less heavily sclerotized and densely covered with short microscopic setae; this area seems to be formed by an out folding of the eighth

segment. From ventral view the ninth segment is deeply cleft, the cerci are large and rounding and the harpagones rather narrow and enlarged at their tips (fig. 91c); from lateral view it is seen that the elaspers are very flat, enlarged and rounding apically; harpagones yellowish in color.

"Length: body, 2.6-2.9 mm.; wings, 2.6 mm.

"*Female*. The association of the females is not at all certain, the specimens apparently belonging to this species run to *torodentis* (Hardy-Knowlton) and cannot be conveniently separated from that species by structural characters. The third antennal segment is yellowish instead of black and the bristles of the middle coxae are stronger and black, being bright yellow in *torodentis*. The front of the female is entirely silvery and sunken between the eyes; base of ovipositor rather rounding, piercer much longer than base and very slender, reaching to about the middle of the third abdominal segment."

Type locality: Hilliard, Florida.

Type in Snow Entomological Collection.

Tömösváryella inconspicua (Malloch)

Pipunculus inconspicuus Malloch, 1913, Proc. U. S. Nat. Mus. 43, 295-296.

This species was described from a single female specimen and as the male was unassociated it cannot be accurately placed. Malloch allies it to *subnitens* Cresson but even this relationship is questionable. The following is the original description.

"*Female*. Frons widest at middle, where it is about one and one-half times as broad as at above antennae, nearly as broad at vertex as at antennae, silvered at lower half, dull black above, face distinctly silvered, narrower than the frons and of nearly uniform width. Occiput silvery below but on upper portion black, antennae black, third joint elongate and distinctly acuminate, silvered, especially apically, arista swollen and glossy black at base; thorax slightly gray-dusted, with scattered pale hairs, humeri whitish, with distinct, long, downy, pale hairs, pleurae gray-dusted, scutellum gray-dusted and with very few weak hairs, squamae white; abdomen short and broad, tapering toward apex, subopaque, first segment gray-dusted laterally, and with distinct lateral comb, other segments only indistinctly gray-dusted low down laterally, a few scattered hairs in the last three segments, ovipositor long, reaching to second ventral segment, distinctly longer than its base; legs black, only knees, bases of tarsi, claws and pulvilli yellowish, no distinct leg bristles and but a little pubescence present, wings clear, inner crossvein distinctly beyond end of first vein and middle of discal cell, outer crossvein slightly shorter than last portion of fifth vein; halteres with brown pedicel and whitish yellow knobs.

"Length, barely 2 mm."

Type locality: Medicine Hat, Alberta, Canada.

The writer has examined the type at the United States National Museum.

Tömösváryella lepidipes n. sp.

(Plate 16, figs. 92a-e)

This species is related to *similis* (Hough) but is readily separated by the shape of the posterior trochanters and the male genitalia; the female ovipositor also differs in shape.

Male. Frontal triangle silvery to pale golden pubescent, front above junction of eyes shining black; eyes joined for about one half the length of the frontal triangle; antennae brown to black, third segment long acuminate below (fig. 92a) and thickly white pubescent; upper portion of occiput shining. *Thorax and abdomen:* Metallic black in ground color, faintly brownish to gray dusted; more distinctly grayed on metanotum and sides of first and fourth terga, thorax rather sparsely haired but with distinct dorsocentrals; humeri and halteres yellow; the legs are much the same as in *similis*, the tarsi, however, are brown to black, only rarely yellowed; the posterior trochanters have distinct raised portion of the middles below, this is covered with dense yellow, microscopic hairs (fig. 92e); in this respect the species approaches *subvirescens* (Loew); the posterior femora possess numerous elongate yellow hairs on their undersides, the hind basitarsi are about as long as next four tarsal subsegments, tarsi but slightly flattened. *Wings:* As in *similis*, however, the r-m crossvein is at the middle of the discal cell and the last section of the fourth vein more consistently curved. Sides of abdomen almost straight, slightly tapering until the fifth segment; fifth abdominal segment about one and one half times as long or longer than the fourth segment; longitudinal groove located about medianly, from dorsal view (fig. 92b). From ventral view the ninth segment is slightly longer than wide with a deep 'V' shaped cleft almost half its length on posterior margin. Harpagones irregular, greatly curved, asymmetrical and rounding apically, the inner clasper is the more developed of the two (fig. 92c); inner margins of claspers not concave as in *similis*.

Length: body and wings, 2.5-3 mm.

Female. Lower one third of front silvery, upper two thirds verging from subshining to polished black. Tarsi brownish as in the male, subsegments slightly more flattened. Posterior trochanters not carinated as in the male but with a dense patch of fine hairs below. Base of ovipositor globose, piercer gradually tapering from base to apex of anal openings, then abruptly narrowing and slightly curved (fig. 92d). Piercer reaching beyond apex of second segment.

This is a widely distributed species, especially common in the west.

Holotype ♂, Fallon, Nevada, August 12, 1940 (L. C. Kuitert); allotype ♀ same locality and date (R. H. Beamer). Ninety-five paratypes from following localities:

Arizona: Chiricahua Mountains, July 4, 1940 (R. H. Beamer); Ruby, July 13, 1940 (R. H. Beamer, D. E. Hardy).

British Columbia: Kimberley, Aug. 6, St. Marys Lake.

California: Mammoth Lakes, July 29, 1940 (R. H. Beamer, D. E. Hardy, L. J. Lipovsky); Sequoia National Park, Aug. 6, 1940 (R. H. Beamer, L. C. Kuitert, D. E. Hardy); Yosemite National Park, Aug. 1, 1940, some specimens on Oak (R. H. Beamer, D. E. Hardy); Tuolumne Meadows, Aug. 1, 1940 (R. H. Beamer); Echo, Aug. 10, 1940 (D. E. Hardy).

Colorado: LaJunta, Sept. 6, 1938 (D. E. Hardy, A. T. Hardy); Maybell, Aug. 18, 1940 (R. H. Beamer).

Kansas: Stafford Co., June 30, 1934, Salt Marsh (C. W. Sabrosky); Wichita, June 29, 1934 (C. W. Sabrosky); Garnett, Aug. 29, 1939-Sept. 22, 1941 (R. H. Beamer, D. E. Hardy); Sand dunes, Medora, Sept. 2, 1929 (R. H. Painter); Cherokee Co., Sept. 2, 1940 (R. H. Beamer).

Nevada: Same as type (R. H. Beamer, D. E. Hardy, L. C. Kuitert); Austin, Aug. 12, 1940 (L. C. Kuitert).

New Mexico: Tajique, June 25, 1940 (R. H. Beamer, D. E. Hardy); Estancia, June 24, 1940 (R. H. Beamer, D. E. Hardy).

Oklahoma: Grove, 11 mi. E., May 16, 1940 (R. H. Beamer).

Pennsylvania: Germ't, June 18, 1905.

Saskatchewan: Bestville, July 5, 1923 (K. M. King).

Texas: Boca Chica, June 30, 1938 (R. H. Beamer).

Utah: Delta, Aug. 14, 1940 (R. H. Beamer, D. E. Hardy); Perry, May 1, 1939 (G. F. Knowlton, F. C. Harmston); Logan Canyon, Aug. 12, 1939 (G. F. Knowlton, G. S. Stains).

Paratypes being returned to Utah State Agricultural College; Kansas State College; Michigan State College; Philadelphia Academy of Science and Canadian National Museum.

Holotype, allotype and a large series of paratypes in the Snow Entomological Collection.

Tömösváryella minacis Hardy

(Plate 16, figs. 93a-c)

Tömösváryella minacis Hardy, 1940, Journ. Kans. Ent. Soc. 13, 110-112.

Following is the original description:

"This species is related to *similis* (Hough) but is readily separated by the development of the male clasping structures; the strongly carinated area on

the dorsum of the outer clasper, the smaller carina of the inner and the broadened apices of these structures will distinguish it; the r-m crossvein is also situated at or slightly beyond the middle of the discal cell, instead of before the middle as in *similis*.

Male. Head: First two segments of antennae black, bristles of second segment short; third segment acuminate, like *similis* in shape, brownish in ground color, densely white pubescent. Face silvery, frontal triangle silvery with a light golden tinge, upper portion of front, above junction of eyes, and vertex shining black; upper portion of occiput subshining, sides silvery. *Thorax:* Shining in ground color, brownish dusted on dorsum of mesonotum and scutellum, rather lightly grayed on margins of mesonotum, distinctly gray pollinose on metanotum and upper portions of pleurae. *Legs:* For the most part, as in *similis*, the bristles of the mid-coxae are strong and yellowish to brown in color; the hind trochanters possess three to four small but distinctly visible hairs on underside near their bases and a medio-ventral patch of dense microscopic pile; this patch is located on a slightly raised area (fig. 93a), this is not distinctly tuberculate as in the vagabunda group. *Wings:* Lightly iridescent, third section of costa about one half the length of the fourth; fifth section not quite twice the length of the third and fourth combined; crossvein r-m situated well beyond the end of vein R_1 (R_{1+2}), and slightly beyond the middle of discal cell; ultimate section of fourth vein straight or nearly so, last section of the fifth about equal to the posterior crossvein in length. *Abdomen:* Chiefly shining, only lightly dusted, sides but slightly rounding; fifth segment one and one third times as long as the fourth. *Hypopygium:* About three fourths the length of the fifth segment of abdomen, the longitudinal groove located just to the left of the median line, membranous apex plainly visible and sometimes extruded. The claspers are developed dorsally into strong carinae, more pronounced on the outer clasper (fig. 93b, c), both claspers are bluntly pointed, the inner one is more slender and larger of the two and is scarcely curved inward at its apex; the outer is more stout and gently curved inward at its apex; neither clasper is concave on the inner margin as in *similis*.

"Length: body, 2.6 mm.; wings, 2.6 mm."

Female: Differs in having the third antennal segment distinctly yellow, the front is silvery pollinose to the vertex, wider and distinctly concave in the middle. Crossvein r-m is situated at end of vein R_1 and distinctly before the middle of discal cell. Flexor spines of femora more developed, hind tibiae dilated on apical halves and tarsi more flattened. Base of ovipositor short and round, piercer slender, twice as long as base, reaching to apex of second abdominal segment.

"Length: body and wings, 2 mm."

Type locality: Key Largo, Florida.

Type in Snow Entomological Collection.

Tömösváryella pauca n. sp.

(Plate 16, figs. 94a-b)

This species is related to *xerophila* n. sp. by having slender obtusely pointed harpagones. It is distinguished by having ninth

segment deeply cleft on hind margin and its lateral margins more acutely pointed at apices; the harpagones are more slender and are concave on their inner margins; the compound eyes are joined on the front for about twice the length of ocellar triangle and ultimate section of fourth vein is shorter than posterior crossvein.

Male. Rather small, chiefly bare species. *Head:* Ocellar triangle and face silvery pubescent; junction of compound eyes about half as long as frontal triangle; bristles of second antennal segment weak, third segment acuminate, yellowish brown in ground color, densely white pubescent. *Thorax* (and abdomen) subshining, lightly dusted with gray on the dorsum, grayed on the sides; metanotum gray with a faint transverse furrow toward upper margin. Dorso-central and marginal hairs very weak. Legs typical in color; front femora with a pair of weak flexor bristles below near bases; middle tibiae with three to four strong apical bristles above; hind trochanters each with an obtuse tubercle below (fig. 94a). Sides of abdomen slightly rounding, widest at segments three to four. *Hypopygium:* Scarcely as long as fifth abdominal segment, evenly compressed to the right, with longitudinal membranous area extending down the middle portion to base of eighth segment; seventh segment visible from dorsal view. From ventral view the membranous area is seen to be very large, extending more than half way to base of eighth segment. Ninth segment about as long as wide and slightly longer than sclerotized portion of eighth segment on left side. Ninth segment acutely pointed on apical margins, cleft deeply 'V' shaped, extending two thirds the length of segment on a middle line. Harpagones simple, slender and rounding apically, inner margins slightly concave. Cerci moderately developed, extending about as long as apices of ninth (fig. 94b).

Length: body and wings, 3-3.2 mm.

Female unassociated.

Holotype ♂, Homestead, Florida, July 19, 1939 (D. E. Hardy). Three paratypes (♂), Suwanee Springs, Florida, Aug. 2-3, 1939 (D. E. Hardy); Hilliard, Florida, Aug. 31, 1930 (R. H. Beamer) and Adel, Ga., Aug. 11, 1939 (R. H. Beamer). All in the Snow Entomological Collection.

Tömösváryella propinqua n. sp.

(Plate 16, figs. 95a-d)

This species is closely related to *vagabunda* but because of the notable differences in the male genitalia it is considered a distinct species. It is readily separated from *vagabunda* by the strongly

curved, slender harpagones of the male, its larger size and lack of gray pollinosity.

Male.—Submetallic black in ground color, sparsely dusted with gray. *Head*: Third segment of antenna acuminate, brown to black in ground color, densely covered with whitish pubescence; front dull grayish pubescent above antennae, shining black above the junction of eyes; eyes joined for a very short distance, this junction is scarcely longer than the length of the ocellar triangle. *Thorax* (and abdomen): A sparse pale pile on dorsum; humeri and halteres bright yellow; legs chiefly black, extreme apices of femora and tibiae and bases of tibiae yellow; front femora with a pair of long flexor bristles near bases below, middle trochanters with three to four pale bristles on apices above; hind trochanters short, little longer than wide, trochanteral development situated on apical portion below; this is rather large and obtusely pointed (fig. 95d). *Wings*: Lightly iridescent; third costal section one fourth the length of the fourth, r-m crossvein situated well beyond end of first vein and at middle of discal cell; ultimate section of fourth vein very slightly curved, petiole of cubital cell comparatively long. Sides of abdomen somewhat rounding, widest at segments three to four. *Hypopygium*: About three fourths the length of the fifth abdominal segment, with the membranous portion of the eighth segment distinctly to the left side (fig. 95a). When the hypopygium is compared to that of *vagabunda* it is seen to be twice as large. From ventral view the membranous area cuts quite deeply into the eighth sclerite; ninth segment distinctly wider than long; apical cleft broadly 'V' shaped, extending almost half the length of the segment on a middle line; at its longest point the ninth segment is shorter than the distance from the base of the ninth to the membranous area. Harpagones very irregular, strongly curved on outside edges, curved inward apically into bootlike developments (fig. 95b). The outer clasper lacks the longitudinal ridge which is characteristic of *vagabunda*.

Length: body, 2.5-2.8 mm.; wing, 2.4-2.6 mm.

Female. The females for the most part fit the characters of *vagabunda*; they are, however, of larger size, more submetallic instead of densely pollinose. The wings are lightly iridescent instead of milky white and the ovipositor tends to be more flattened dorso-ventrally (fig. 95c).

This species is very widely distributed, more abundant in western America.

Holotype ♂, Oliver, B. C., Canada, 8-6-31 (J. Nottingham);

allotype ♀, same data. Two hundred and twenty-three paratypes from the following localities:

Arizona: Chiricahua Mountains, July 4, 1940 (D. E. Hardy).

British Columbia: Same as type (H. T. Peters, L. D. Anderson, M. W. Sanderson).

California: Little Lake, July 25, 1940 (D. E. Hardy); Lone Pine, July 28, 1940 (R. H. Beamer, D. E. Hardy); Kernville, July 25, 1940 (R. H. Beamer); Seeley, July 17, 1940 (L. C. Kuitert, R. H. Beamer, D. E. Hardy); Lake Tahoe, Aug. 11, 1940 (D. E. Hardy); Bishop, July 28, 1940 (D. E. Hardy); Rosemond, July 23, 1940 (R. H. Beamer, E. E. Kenaga, D. E. Hardy).

Colorado: Delta, Sept. 4, 1938 (D. E. Hardy, A. T. Hardy); Colorado Springs, 5915 ft., Aug. (E. S. Tucker); Fruita, Sept. 4, 1938 (D. E. Hardy, A. T. Hardy); Cerro Summit, El. 9,500 ft., Sept. 5, 1938 (D. E. Hardy, A. T. Hardy); Craig, Aug. 18, 1940 (R. H. Beamer); Wray, Aug. 23, 1940 (L. J. Lipovsky); Akron, Aug. 23, 1940 (R. H. Beamer).

Kansas: Wichita, June 29, 1934 (C. W. Sabrosky); Stafford Co., June 30, 1934 (C. W. Sabrosky); Douglas Co., Aug. 25, 1939 (R. H. Beamer); Manhattan, Sept. 16, 1933 (C. W. Sabrosky).

Manitoba: Treesbank, July 23, 1915 (N. Criddle).

Minnesota: Badger, July 18, 1935 (D. G. Denning); Norman Co., Aug. 1, 1923 (A. A. Nichol); Ft. Snelling, Aug. 2, 1923, High Prairie (R. W. Dawson).

Nevada: Ely, Aug. 13, 1940 (D. E. Hardy).

New Mexico: Estancia, June 24, 1940 (D. E. Hardy); Cloudcroft, June 27, 1940 (R. H. Beamer, L. J. Lipovsky, D. E. Hardy); Mountain Park, June 27, 1940 (R. H. Beamer); Santa Rosa, June 23, 1940 (R. H. Beamer, D. E. Hardy).

Texas: Romero, June 22, 1940 (D. E. Hardy).

Utah: Goshen, Aug. 16, 1940 (R. H. Beamer, D. E. Hardy, L. C. Kuitert, E. E. Kenaga); Duchesne, Aug. 17, 1940 (R. H. Beamer); Delta, Aug. 14, 1940 (R. H. Beamer, E. E. Kenaga, D. E. Hardy); Ephraim, Aug. 16, 1938 (G. F. Knowlton); Magna, Aug. 4, 1938 (G. F. Knowlton, G. S. Stains); Brigham, Aug. 12, 1938 (G. F. Knowlton, D. E. Hardy); Price, Sept. 4, 1938 (D. E. Hardy, A. T. Hardy); Brigham, July 15, 1940 (G. S. Stains, G. F. Knowlton).

Holotype, allotype and a large series of paratypes in the Snow Entomological Collection. Paratypes returned to Utah State Agricultural College; University of Minnesota; Michigan State College and the United States National Museum and Canadian National Museum.

Tömösváryella quadradentis n. sp.

(Plates 16-17, figs. 96a-d)

This species is related to *toxodentis* (Hardy-Knowlton) but is easily separated by the large square topped processes on the hind trochanters of the male.

Male. Subopaque species, the shining black ground color being obscured by dense grayish pollen and sparse pale pile. Antennae black, third segment acuminate (fig. 96e). Eyes joined for only a short distance on the front; the length of this junction is scarcely longer than the length of the ocellar triangle. Front slightly concave on lower portion, front and face densely silvery pubescent. Humeri and knobs of halteres yellow. Legs black except for yellow apices of femora and tibiae, bases of tibiae and first two to three tarsal subsegments. Femoral spines very weak, no apparent flexor bristles at bases of front femora; middle coxae with three or more long yellow bristles at their apices above; hind trochanters each with a large square-topped development near middles below (fig. 96d). This process is somewhat oblique in position and about equal to the width of the trochanter in length. Wings milky-white, third costal section about one third the length of the fourth, fifth section about one and one half times as long as third and fourth combined. Crossvein r-m situated just beyond end of vein R_{1+2} and at about middle of discal cell; last section of fifth vein slightly sinuate. Abdomen gently tapering, widest at segments two to three. *Hypopygium:* Elongate, tapering to quite an acute point, almost twice as long as wide and distinctly longer than fifth abdominal segment. From dorsal view a distinct longitudinal groove is visible on the left side (fig. 96b). From the ventral view the eighth segment is over twice the length of the ninth and with a small membranous area at the extreme tip. The ninth segment is little longer than wide, broadly rounding on posterior apices, with a small 'V' shaped cleft on hind margin. Harpagones rather long and slender, somewhat concave on inner margins. Cerei very large and greatly curved, completely covering the bases of harpagones (fig. 96a).

Length: body, 3.3-3.8 mm.; wing, 2.7-3.1 mm.

Female. Front very broad, widened at middle portion, entirely silvery opaque. Front femora with a pair of strong flexor bristles near bases below, apical bristles of middle coxae strong and dark in color. Ovipositor rather elongate, base somewhat globose, piercer long and slender, extending to about base of third abdominal segment and about twice as long as its base; otherwise as in male.

The females appear to be inseparable from those of *toxodentis*; the wings are more milky white, however, and the ovipositor seems slightly longer.

Holotype ♂, Lone Pine, California, July 28, 1940 (D. E. Hardy); allotype ♀ same data. One hundred and sixty-six paratypes, one hundred and thirty-three ♂♂ and thirty-three ♀♀ from the following localities: Same as type (R. H. Beamer, D. E. Hardy, E. E. Kenaga); Onyx, California, July 28, 1940 (R. H. Beamer, E. E. Kenaga, D. E. Hardy); Kernville, California, July 24, 1940 (R. H. Beamer); Little Lake, California, July 25, 1940 (D. E. Hardy); Mammoth Lakes, Calif., July 29, 1940 (L. J. Lipovsky, D. E. Hardy); Mono Lake, Calif., July 31, 1940 (L. C. Kuitert); Olancho, Calif., Aug. 25, 1940 (D. E. Hardy); Fallon, Nevada, Aug. 12, 1940 (R. H. Beamer, L. C. Kuitert, D. E. Hardy) and Carson City, Nevada, Aug. 12, 1940 (R. H. Beamer, E. E. Kenaga, D. E. Hardy). All are in the Snow Entomological Collection.

Tömösváryella sachtlebeni (Aczel)

(Plate 17, figs. 97a-e)

Pipunculus sachtlebeni Aczel, 1940, Zool. Anzeiger, 1.12, Bd. 132, Heft 7/8, 152.

Pipunculus unguiculatus Cresson, (nec Zeller, 1860) 1911, Trans. Amer. Ento. Soc. XXXVI, 319.

This species belongs in the so-called *vagabunda* group because of the development of the hind trochanters. The shape of the trochanteral process and genital characters separate it from other species in this complex.

Male. Very similar in most respects to *similis* (Hough), although the body is more distinctly brown pollinose, the polished ground color being almost obscured by the pollen. The compound eyes are joined on the front for more than one half the length of the frontal triangle, frontal triangle silvery but with an opaque black spot in the central portion. *Legs*: Chiefly black as in other species of the complex, femora moderately thickened, spines weak on front and hind femora but rather well developed on middle pair; front femora with one to two flexor bristles near bases. Mid-coxae each with a pair of rather long bristles at their apices; hind trochanters each with a well developed slightly curved toothlike process below, near bases (fig. 97c); this process is about equal to the width of the trochanter in length and rather bluntly pointed. *Wings*: Lightly iridescent, third section of costa one third to one fourth the length of the fourth section; fifth section about one and one half times as long as third and fourth combined. Crossvein r-m situated beyond

the end of vein R_{1+2} and at the middle of the discal cell; last section of fourth vein slightly curved, last section of fifth vein shorter than the posterior crossvein (fig. 97b). *Abdomen*: Sides slightly rounding, widest at segments three and four; fifth segment about one and one third times the length of the fourth. *Hypopygium*: About equal to the fifth segment in length, slightly compressed to the right with a longitudinal groove just to the left of the median line and the membranous area projected, making a keel-like development at the apex (fig. 97d). From ventral view the membranous apex of the eighth segment is rather large, extending half the length of the segment toward the base. Claspers rather simple, slightly curved and bluntly pointed, inner clasper little longer than the outer and more distinctly curved inward at its apex. Ninth segment longer than wide with a broadly 'V' shaped cleft on hind margin, extending about one half its length on a median line; ninth segment much longer than sclerotized portion of eighth on left side, from ventral view (fig. 97e). Cerci elongate, extending much beyond apex of ninth segment.

Length: body and wings 3.2 mm.

Female unassociated.

Type locality: Falls Church, Virginia.

The writer has studied the type at the Cambridge Museum of Comparative Zoölogy and a series of topohomotypes, and has identified the species from numerous localities from the following states and Canadian province: Florida, Indiana, Iowa, Kansas, Michigan, New Jersey, Saskatchewan, Tennessee and Virginia.

Tömösváryella similis (Hough)

(Plate 17, figs. 98a-h)

Pipunculus similis Hough, 1899, Proc. Bost. Soc. Nat. Hist. XXIX, 84.

This species has been very vaguely defined and its identification could never be made certain from the original description; *similis* is near *braueri* Strobl of Europe but the third antennal segment is not so long acuminate and the hypopygium is different from that species.

Male. Almost bare species, with only scattered pale hairs on thorax and abdomen. *Head*: Face silvery, frontal triangle silvery with a golden tinge; vertex and front above junction of the eyes shining black; occiput subshining above, gray on the sides; eyes joined on the front for less than one half the length of the frontal triangle (fig. 98h); third segments of antennae yellow to yellow-

brown in ground color, acuminate below (fig. 98a). *Thorax* (and abdomen): Metallic black ground color, rather thickly covered with grayish to brown dust, this pollinosity is caused by a covering of the integument with microscopic scales. Metanotum and pleurae distinctly grayed; humeri and halteres yellow. *Legs*: Chiefly black, apices of femora and tibiae, bases of tibiae and first four tarsal subsegments yellow; apical subsegments of tarsi yellow-brown; femora only moderately thickened, spines weak, anterior pair with two distinct flexor bristles near bases; middle coxae with three, downward projecting bristles above at apices; hind trochanters with a clump of bristles or hairs on undersides near bases (fig. 98f), the size and number of these hairs appears to vary a great deal; posterior tarsi flattened, basitarsi longer than next three subsegments. *Wings*: Third costal section about one half the length of fourth, fifth section about twice as long as the third and fourth combined; crossvein r-m situated at about the end of R_{1+2} and well before the middle of the discal cell; ultimate section of fourth vein faintly curved, last section of fifth vein shorter than the posterior crossvein in length. *Abdomen*: Sides almost straight, slightly rounded at segments two to four; fifth segment one and one half times the length of the fourth; hypopygium about three fourths the length of the fifth segment (fig. 98e). *Hypopygium* compressed to the right with an apical cleft and median depression formed by the ends of the eighth tergum coming together on the dorsum. Seventh tergum rather broad, chiefly ventral in position, scarcely visible from dorsal view; sixth tergum entirely ventral with but a thin strip of the sclerite running around the left side. Ninth segment about as broad as long, with a deep 'V' shaped concavity for more than half its length on posterior margin. Harpagones almost symmetrical, the one on the inner side but slightly larger than the outer, rather slender and terminating in an acute point on inner apices; rather strongly curved and distinctly concave on inner margins (fig. 98d).

Length: body and wings, 2.2-2.7 mm.

Female. The females are difficult to separate as is typical of this genus; about the upper one half of the front is shining black, front broader than the face and depressed in the middle. The abdomen is faintly gray pollinose. Bristles of front femora, middle coxae and hair clump of hind trochanters very distinct; middle femora often with two strong bristles near bases beneath; post-tarsi strongly flattened and dilated. Base of ovipositor subglobose, piercer not much longer than base (fig. 98g). Otherwise like the male.

Type locality: Tifton, Georgia.

The writer has studied the type at the Field Museum in Chicago and has homotopotypes taken August 11, 1939 (A. T. Hardy) also homotypes from the following localities: Griffin, Georgia, 8-12-39 (R. H. Beamer, D. E. Hardy, A. T. Hardy, E. G. Wegenek); Ottawa County, Kansas, June 24, 1934; Garnett, Kansas, August 29, 1939 (R. H. Beamer). Specimens have been identified from a large number of localities in Alabama, Arizona, Kansas, Ohio, Oklahoma, Pennsylvania and Utah.

Tömösváryella sonorensis (Cole)

(Plate 17, fig. 99a)

Pipunculus sonorensis Cole, 1923, Proc. Calif. Acad. Sci., V. 12, Series 4, 467.

This species apparently belongs in the toxodentis group as the original description implies that the hypopygium is long and slender. The shape of the development on the posterior trochanter places it near *quadridentis*; this structure, however, is yellowish, square topped and extends longitudinally on the trochanter. The following is the original description:

"Male. Length 3 mm. Frons narrow, extending slightly over half way to posterior eye margin, silvery pollinose. Eyes touching for a very short space, the ocellar triangle narrow and black. Face silvery pollinose, slightly narrowing toward oral margin. Antennae blackish brown, third joint long and acuminate, paler on apical half, with a black arista. Occiput black, sides thinly silvery pollinose.

"Mesonotum and scutellum black, thinly gray dusted, oval in outline; humeri pale. Postnotum gray pollinose. Pleura black, gray pollinose. Part of stem of halteres brown, the knob yellowish white.

"Abdomen black, thinly gray dusted, oval in outline; pile sparse, pale, a few larger hairs at base of first segment. Hypopygium as long as fifth segment, slender, asymmetrical, largely developed on right side.

"Legs black, the apices of femora and narrow bases of tibiae yellow. Hind femora unarmed, the trochanters with a large, blunt, yellowish tooth. Hind tibiae strong, the first tarsal joint slender. Wings hyaline, the stigma hyaline. Space between apex of subcostal vein and R_1 about half that between R_1 and R_{2+3} . Small crossvein about middle of cell 1st M_2 and beyond apex of R_1 . Last section of M_{1+2} (fourth vein) distinctly sinuate."

Female unknown.

Type locality: Tepoca Bay, Sonora, México.

Type at California Academy of Science.

Tömösváryella subnitens (Cresson)

(Plate 17, figs. 100a-g)

Pipunculus subnitens Cresson, 1911, Trans. Amer. Ent. Soc. XXXVI, 316.

This species belongs in the *similis* group but is readily distinguished by the gray pollinosity of the thorax and abdomen as well as by genital characters.

Male. Frontal triangle and face silvery pubescent, upper portion of front and vertex shining black; occiput chiefly cinereous, more lightly dusted above. Compound eyes joined for less than one half the length of the frontal triangle. First two antennal segments black, bristles of second segment weak; third segment yellow to yellow-brown, long acuminate below (fig. 100a) and densely white pubescent. *Thorax:* Gray pollinose, distinctly cinereous on the pleurae, metanotum, scutellum and margins of mesonotum; mesonotum with scattered pale hairs, more numerous toward the anterior portion. Humeri and halteres yellow. *Legs:* Chiefly black, extreme apices of femora and tibiae, bases of tibiae and the first four tarsal subsegments yellow, last subsegment of tarsi brown. Front femora with two small flexor bristles near bases; hind trochanter without conspicuous hairs or bristles but very slightly carinated below (figs. 100c, d); femoral bristles very weak, hairlike or wanting. Hind femora moderately thickened, hind tibiae distinctly arcuate; posterior basitarsi about as long as next four tarsal subsegments. *Wings:* Milky-white with but a very faint iridescent cast, wings short and rounding apically; third section almost three times the length of the third and fourth combined. The fork of the Rs situated before the arculus; crossvein r-m at or slightly beyond the middle of the discal cell and just before the end of vein R_{3+4} . Last section of fourth vein distinctly curved, last section of fifth about equal in length to the posterior crossvein (fig. 100e). *Abdomen:* Subshining in ground color, first segment and lateral margins of the rest of abdomen cinereous; faintly to densely gray dusted on the dorsum, the pollinosity usually obscuring the ground color. Sides slightly rounding, widest at segment three; fifth segment almost as long as third and fourth combined. *Hypopygium:* About three fourths the length of the fifth segment, slightly compressed to the right, with an apical depressed area and a median groove, formed by the coming together of the edges of the eighth tergum (fig. 100b). From ventral view the ninth segment is as broad as long and terminates apically in two rounding lobes, posterior median

margin deeply concave. Harpagones irregular, asymmetrical and bluntly pointed (fig. 100g).

Length: body, 2.8 mm.; wings, 2.5 mm.

Female. Front broader than the face and sunken in the middle, chiefly silvery, shining black on upper one third. Thorax usually less grayed above and pollinosity of abdomen more generalized than in the male. Ovipositor rather short; base globose, piercer about equal in length to its base (fig. 100f) and reaching to about the apex of the third abdominal segment. Tarsal subsegments flattened and rather broad; otherwise like the male.

Length: body, 2.8 mm.; wings, 2.3 mm.

Type locality: Alamogordo, New Mexico.

The writer has studied the type at the Philadelphia Academy of Science and has homotypes from Laramie, Wyoming, 6-23-35 (R. H. Beamer, Jack Beamer) and Cuyama Ranch, Calif., 7-25-35. (R. H. Beamer).

This is a common western species. Specimens have been determined from numerous localities in the following states: Arizona, California, Colorado, Kansas, Nevada, New Mexico, and Utah.

Tömösváryella subvirescens (Loew)

(Plate 17, figs. 101a-e)

Pipunculus subvirescens Loew, 1872, Centuria X, Berl. Ent. Zeitse. XVI, 87. Type male No. 456 examined in Cambridge Museum of Comparative Zoölogy.

Pipunculus pilosiventris Becker, 1900, Berl. Ento. Zeitschr. XLV, 233. New synonymy.

Pipunculus aridis Williston, 1893, North American Fauna, VII, 255. (Synonymy by Hough, 1899, Proc. Bost. Soc. XXXIX, 78).

Pipunculus albisetæ Cresson, 1911, Trans. Amer. Ento. Soc. XXXVI, 318. New synonymy.

Pipunculus insularis Cresson, 1911, Trans. Amer. Ento. Soc. XXXVI, 317-318. New synonymy by comparison of types.

Pipunculus metallescens Malloch, 1913, Proc. U. S. Nat. Mus. 43, 298. New synonymy by study of type male.

Pipunculus knowltoni Hardy, 1939, Jour. Kans. Ent. Soc. vol. 12, 20-22. New synonymy by type comparison.

Pipunculus translatus Walker? 1857, Trans. Ento. Soc. London, IV, 150. Cresson has suggested that this possibly belongs here but as its position is questionable *subvirescens* is not being considered a synonym.

Synonymy of *pilosiventris* Becker was discovered by Aczel after the writer had presented him with American specimens of Loew's species. *P. pilosiventris* had been known from Egypt, from Palearctic region, Mediterranean subregion and from Abyssinia (Ethiopia), Ethiopian region, East African subregion.

P. albisetæ Cresson synonymy by comparison of type female with a series of *subvirescens* females which had been associated with the males; it possesses the identical characteristics.

P. knowltoni Hardy was proposed as a new species on a basis of the striking post-trochanteral character of the males (fig. 101a).

This character has been omitted in other descriptions and represents one of the best characters for separation of the species.

Examination of the type of *subvirescens* cleared up one of the most perplexing problems in the DORILAIIDAE. The true identity of the species has long been unknown. It has heretofore been considered very near and difficult to separate from *similis* (Hough) and this general complex has been known as the *subvirescens* group; the species actually keys into a different group by having the male hypopygium symmetrical.

The species is easily recognized by the symmetrical hypopygium and the flat-topped development on the hind trochanters of male.

Male. Chiefly subshining to metallic black species, faintly dusted on the thorax and abdomen. Eyes contiguous for about one third the length of the front, antennae typical of the genus, third segment acuminate with whitish pubescence. Humeri whitish, halteres yellow. Legs rather typical except for the distinctive developments on the posterior trochanters. Wings typical for genus. Sides of abdomen almost straight, fifth segment one and one third longer than fourth. *Hypopygium*: Three fourths as long as fifth segment, sub-hemispherical, not compressed, with a distinct cleft on right side. The cleft on the right side of hypopygium is formed by the junction of the margins of eighth sclerite; the seventh and ninth segments are usually visible from above. The membranous depressed area of the eighth is distinct and on the right side (fig. 101b). The ninth segment is short and rounding, as broad as long and 'U' shaped cleft on posterior margin. Harpagones very irregular and asymmetrical (fig. 101c-e) with numerous carinae and furrows longitudinally. The inner harpagone is very flat laterally (fig. 101d) and the outer is larger, more irregular from this view (fig. 101e).

Length: body, 3 mm.; wing, 3.3 mm.

Female. The front is entirely silvery, sometimes faintly shining near vertex. Ovipositor short, piercer not much longer than base; base with a small tubercle below.

Type locality: Belgrave, Texas.

The writer has studied the type at the Cambridge Museum of Comparative Zoölogy.

The species has an unusual range, which accounts for some of the synonymy; specimens have been identified from Perú, Bermuda Islands, Cuba, Nicaragua and almost every state and Canadian province. The writer has found them to be one of the most abun-

dant species affecting leafhoppers in Bermuda grass. Ashmead³¹ believes this species to be parasitic upon *Draeculacephala versata* but this is unconfirmed.

Tömösváryella sylvatica (Meigen)

(Plate 17, figs. 102a-f)

Pipunculus sylvaticus Meigen, 1824, System. Besch. IV, 20.

Pipunculus scoparius Cresson, 1911, Trans. Am. Ent. Soc. XXXVI, 317.

Pipunculus hirticollis Becker, 1910, Deut. Ent. Zeit. Berlin, 657.

This species is related to *coquilletti* (Kertész) by having strong bristles on hind trochanters, but the two are most easily separated by use of the male genitalia; the long slender harpagones will distinguish it.

Male. Head: Face silvery, frontal triangle silvery to golden pubescent; upper portion of front shining black; eyes joined for about one third the length of the frontal triangle; antennae black, third segment acuminate, bristles of second segment weak (fig. 102a). *Thorax and abdomen:* Metallic black, very faintly dusted, the ground color scarcely obscured; metanotum, parts of pleurae and first abdominal segment more distinctly grayed; mesonotum with distinct dorsocentral hairs; abdomen sparsely haired, these are more abundant and more bristlelike on the sides of the fourth and fifth terga; legs chiefly black, only extreme apices of femora and tibiae, broad bases of tibiae and first four tarsal subsegments yellow, last subsegments of tarsi brown; femora normal in thickness, without any noticeable flexor spines developed, front femora lacking the usual pair of basal flexor bristles; mid-coxae with three to five strong bristles projecting downward from their apices; hind trochanter with two to five very strong bristles below (fig. 102e); posterior tibiae slightly surved; posterior basitarsi but little longer than the next three subsegments. *Wings:* Faintly iridescent, third section of costa almost one half the length of the fourth; fifth section one and one half times as long as the third and fourth combined; crossvein r-m situated beyond the end of vein R_{1+2} and about at the middle of the discal cell; ultimate section of fourth vein slightly curved. Sides of abdomen almost straight, scarcely any difference in width from the first to fifth segments; fifth segment only a little longer than the fourth. *Hypopygium:* About equal to the fifth segment in length in normal position, but it is usually somewhat extended so that the seventh and ninth segments are plainly visible from a dorsal view. Hypopygium slightly compressed to the right with an apical depressed area and a median

31. 1895, "Notes on Cotton Insects Found in Mississippi." Insect Life, VII, 326 (*Diedrocephala*.)

groove on the right side (fig. 102d). From ventral view the ninth segment is but little longer than wide and rather deeply concave on posterior margin. The harpagones are elongate, slender and simple, almost symmetrical (fig. 102e).

Length: body and wings, 3.2-3.4 mm.

Female. Third antennal segment with a tinge of yellow in ground color; front shining on upper one third to one fourth, wider in the middle than width of face. Front femora each with a pair of strong flexor bristles; mid-femora with one to two strong basal bristles beneath; posterior trochanters with a small clump of stout bristles, usually about three in number and not nearly as strong as in the males; hind tibiae somewhat enlarged apically; hind tarsi flattened and dilated. Base of ovipositor subglobose; piercer much longer than base and extending almost to base of second abdominal segment.

Described from Europe. The type is probably in the Museum of Paris.

The writer has studied the type of *scoparius* at the Boston Museum of Natural History and compared a large series of homotypes. It is widely distributed throughout Europe and America, and has been identified from the following states and Canadian provinces: Arizona, British Columbia, California, Colorado, Georgia, Iowa, Kansas, Manitoba, Massachusetts, Michigan, Minnesota, Nevada, New Hampshire, New Mexico, New York, North Carolina, Ohio, Quebec, Rhode Island, Saskatchewan, South Dakota, Tennessee, Texas, Utah, Vermont and Virginia.

Tömösváryella toxodentis (Hardy-Knowlton)

(Plate 18, figs. 103a-b)

Pipunculus toxodentis Hardy-Knowlton, 1939, Ann. Ento. Soc. Amer. XXXII, 118-120.

This is a very well defined species and can be separated from all other *Tömösváryella* by the shape of the process on the hind trochanter of the male and the peculiar hypopygium.

The following is the original description:

Male. Front, face and occiput silvery pruinose. Second segment of antennae black with short black bristles above; third segment acuminate brownish with hoary tinge, whitish fringed. Humeri and halteres yellow-white, the bases of the halteres brown. Dorsum of thorax subshining with gray pollen on the sides and on the scutellum; the entire dorsum of thorax and abdomen rather thickly covered with pale brownish hairs. Pleurae, sternum, coxae and femora (except yellow apices) black, dusted with grayish; meso-coxae with a clump of long black hairs on the inner edge apically. Trochanters more shining, with a long curved tooth on each, near base (fig. 103b). Tibiae narrowly

yellowed at bases and apices, otherwise black; posterior tibiae but slightly curved. Tarsi yellow, first tarsal segment slightly longer than next three segments and about three times as long as segment five. Spines of femora and tibiae not strongly developed.

"Abdomen covered with short black hair, denser and longer on lateral margins of the posterior segments, the last few segments of abdomen usually curved downward, and the genitalia sometimes curved beneath the abdomen. Abdomen subshining metallic, slightly pruinose on the sides. Lateral comb of first segment composed of numerous long yellow-brown hairs. Hypopygium elongate, slightly longer than fifth segment and tapering to a blunt point (fig. 103a), compressed to left but with a small dorsal cleft at middle near the base and extending down right side.

"Wings hyaline with a light brownish tinge, stigma not colored.

"Length: wing, 3.2-3.4 mm.; body, 3.3-3.5 mm.

"*Female*. Front silvery to just below ocelli, slightly concave in the middle; occiput dull black above, silvery on the sides. Abdomen shining, only dusted on the sides. Piercer of ovipositor elongate, about twice as long as its base and reaching almost to the base of the addomen or at least to second segment. Posterior trochanters with a small clump of short yellow hairs basally, beneath, front femora with two long hair-like bristles on the underside near bases."

Type locality: Salt Lake City, Utah.

Type in United States National Museum Collection.

This is a common western species, having been taken in a number of localities in the following states: California, Colorado, Kansas, New Mexico, Texas, Utah, Wyoming.

This species was taken in abundance in association with *Dicyphonia* at Goshen, Utah.

Tömösváryella tumida Hardy

(Plate 18, figs. 104a-c)

Tömösváryella tumida Hardy, 1940, Journ. Kans. Ent. Soc. 13, 112-113.

Following is the original description:

"This species is related to *vagabunda* (Knab) but is readily separated by the male genital structures.

"*Male*. *Head*: First two segments of antennae brown to black, third segment brown, with a distinct yellow tinge in ground color and terminating in a slender acuminate point below. Face silvery, frontal triangle golden; front, above junction of eyes, black. Eyes joined for less than one half the length of the frontal triangle. *Thorax*: Metallic black in ground color, dusted with brown on the dorsum, faintly grayish on the upper portions of the pleurae, metanotum and margins of mesonotum; dorsocentral hairs weak. Legs chiefly black, narrow apices of femora and tibiae, broad bases of tibiae and first four tarsal subsegments yellow, apical subsegments of tarsi brown. Femora rather slender, spines very weak; front femora each with two small flexor bristles near bases; middle coxae with three to four strong apical bristles; hind trochanters with a distinct moundlike development on the undersides near apices (fig. 104a), this is fringed with dense white pile. Hind tarsi almost straight, with

just a slight curvature; tarsi slightly flattened, basitarsi about equal to the next four tarsal subsegments in length. *Wings*: Distinctly infusated and iridescent, third section of costa less than one half the length of the fourth; fifth section about equal to the third and fourth combined. Crossvein r-m situated at the end of vein R_1 (R_{1+2}) and well before the middle of the discal cell. Ultimate section of fourth vein almost straight, last section of fifth vein about equal to posterior crossvein in length. *Abdomen*: Polished black only very faintly dusted on the dorsum, the ground color scarcely obscured; rather short, but little longer than the thorax, the sides gently rounding, widest at segment three. *Hypopygium*: Slightly compressed to the right, the longitudinal groove is just to the left of a median line, the membranous apex is distinct and slightly protruded (fig. 104b); hypopygium about three-fourths the length of the fifth segment. From ventral view the ninth segment is but little longer than wide, with a deep V-shaped cleft for almost half its length on posterior margin. Harpagones board and strongly developed, asymmetrical, the inner clasper being the larger of the two; these are rather acutely pointed on inner apices, distinctly concave on inner margins and each with a pronounced niche near bases on outer margins (fig. 104c).

"Length: body, 2.5 mm.; wings, 2.4 mm.

"*Female*. Front chiefly silvery with only extreme upper portion, just below vertex, shining black; third segment of antennae more distinctly yellow; flexor bristles at base of front femora more distinct than in male, bristles of middle coxae weaker; posterior trochanters without tubercles but with a patch of short hairs below, near bases; tarsi more flattened. Base of ovipositor globose, piercer almost twice as long as base and reaching just past the apical margin of the second abdominal segment."

Type locality: Belle Glade, Florida.

Type in Snow Entomological Collection.

The species is widely distributed, having been identified from the following states: California, Colorado, Georgia, Kansas, Nevada, New Mexico, and Utah.

Tömösváryella turgida Hardy

(Plate 18, figs. 105a-c)

Tömösváryella turgida Hardy, 1940, Journ. Kans. Ent. Soc. 13, 113-114.

This is a well defined species, characterized by its large blunt trochanteral developments, the large cerci and divergent harpagones.

Following is the original description:

"*Male. Head*: Face and frontal triangle silvery, front shining black above junction of eyes; compound eyes joined for about one third the length of the frontal triangle. Antennae brown to black, third segment acuminate, rather thickly white pubescent; bristles of second segments short. *Thorax and abdomen*: Polished in ground color, rather heavily gray to brown pollinose; margins of mesonotum and scutellum with distinct hairs, dorsocentral hairs strong; abdomen almost bare. Legs chiefly black, apices of femora and tibiae, bases of tibiae and first four tarsal subsegments yellow, apical subsegments of tarsi brownish. Femora moderately thickened, spines weak, strongest on mid-

femora; front pair each with a pair of flexor bristles near bases; middle coxae with three to four long yellow bristles apically. Posterior trochanters armed with a large blunt process in middle on their undersides, this development is about as long as the thickness of the trochanter at apex and about as thick as the trochanter at base (fig. 105b). Hind tibiae enlarged apically; hind tarsi flattened laterally basitarsi about equal to next four tarsal subsegments. *Wings*: The third costal section is about one third the length of the fourth; the fifth is about one and one half times the length of the third and fourth combined. Crossvein r-m is situated much beyond the end of the vein R_1 (R_{1+2}) and at the middle of discal cell. Last section of fourth almost straight, last section of fifth slightly shorter than the posterior crossvein. Abdomen slender, slightly bulged at segments two and three and narrowing gradually towards the hypopygium; fifth abdominal segment but little longer than the fourth. *Hypopygium*: Almost equal to the fifth segment in length, eighth sclerite rather sharply pointed at apex on the right; apical depression very distinct and about in the middle; longitudinal groove slightly to the left of a median line; the membranous area is not protruded (fig. 105a). Ninth segment rather deeply V-shaped cleft on hind margin, longer than wide; claspers fairly simple, almost symmetrical, widely diverged toward their apices, not paralleled as in most species (fig. 105c).

"Length: body, 2.8 mm.; wings, 2.7 mm.

"*Female*. The association of the female cannot be certain, the specimens at hand apparently belong here. The front is silvery to the vertex; hind trochanters normal in shape, tarsi more flat and dilated. Base of ovipositor subglobose, piercer longer than base reaching beyond the apex of second segment."

Type locality: Griffin, Georgia.

Type in Snow Entomological Collection.

The species is known from the following states and Canadian province: Arizona, Georgia, Kansas, Nevada, California, Ohio, Texas and Saskatchewan.

Tömösváryella utahensis (Hardy-Knowlton)

(Plate 18, figs. 106a-d)

Pipunculus utahensis Hardy-Knowlton, 1931, Ann. Ento. Soc. Amer. XXXII, 122-123.

This species is related to *wilburi* (Hardy) and *sachtlebeni* (Aczel) but differs from these in the development of the bristles of the middle coxae and the process of posterior trochanters and the characters of the hypopygium.

Male. Subshining black to metallic. Eyes joined for about one third the length of the front. Antennae typical. *Legs*: Typical in color, middle coxae with four to five, distinctly separated, black bristles (fig. 106b). Wings typical for the genus. Posterior trochanters each with a sharply pointed process near bases below (106c). Sides of abdomen almost straight. *Hypopygium*: Compressed to the right with a longitudinal groove just off the median

line on the left side, membranous portion usually projecting slightly at the apex; seventh tergum just barely visible, on the left side, from above. (fig. 106d). From a ventral view the ninth sclerite is longer than wide and with a rather shallow concavity on its posterior margin. Harpagones rather simple, almost symmetrical, somewhat concave on inner margins and gently curved; rounding apically. Cerci extremely large, strongly sclerotized, almost covering bases of claspers (fig. 106a). This character is very good for distinguishing the species.

Female. Face and lower portion of front silvery, upper portion shining black with a narrow shining ridge down middle. Front femora each with two long flexor bristles near bases below; hind trochanters with small clumps of short hairs beneath. Piercer of ovipositor slender, extending to second abdominal segment, base globose.

Type locality: Lehi, Utah.

Type in United States National Museum Collection.

The species is known from numerous localities in Arizona, California, Colorado, Minnesota, Nevada, New Mexico, Ontario, Saskatchewan, Utah and Wyoming.

This species is collected commonly in Bermuda grass.

Tömösváryella vagabunda (Knab)

(Plate 18, figs. 107a-e)

Pipunculus vagabundus Knab, 1915, Proc. Biol. Soc. Wash., 28.

Pipunculus trochanteratus var. *tenellus* Hardy-Knowlton, 1939, Ann. Ent. Soc. Amer. XXXII, 121. New synonymy.

Comparison of specimens of *tenellus* with the type of *trochanteratus* Malloch (nec Becker) proved it to belong to a distinct species and not a variety as was formerly considered. The genital characters separate it readily from *columbiana* (change of name for *trochanteratus*). Comparison of *tenellus* specimens with the type of *vagabundus* (Knab) indicated that they might be the same. The single male specimen (holotype) in the type series of *vagabundus* is in poor condition; the trochanters are glued together so their structure cannot be seen; the abdomen is more subshining than in typical *tenellus* and the genitalia are not visible, but cinereous pollinosity is variable for the species. The original description is not ample to distinguish this species. In light of the evidence presented by life history studies there is little doubt that this is the species reared from *Eutettix tenellus* by Severin as it is definite that this is the important beet leafhopper parasite in the west.

Male. Small, rather densely gray pollinose species, with sparse pale pile on dorsum of thorax and abdomen. *Head:* Face and frontal triangle silvery white; front above junction of eyes shining black; eyes joined for about one third the length of the frontal stripe; first two antennal segments black; third segment yellowish to brown with a faint yellowish tinge in ground color, acuminate and densely white pubescent (fig. 107a). *Thorax:* Brownish to gray dusted above, scutellum, metanotum, margins of mesonotum and upper portions of pleurae grayish pubescent; sternopleurae chiefly polished black; legs chiefly black, femora rather slender, flexor spines distinct only on apical third of middle femora; front femora each with a pair of bristles below near bases; mid-coxae with three to four thin but rather elongate bristles at apices; hind trochanters each with a pronounced rounding tubercle near middles below (fig. 107b); hind tibiae almost straight; tarsi only slightly flattened, basitarsi longer than next three subsegments. *Wings:* Lightly iridescent, third costal section about one third the length of the fourth; third and fourth combined are about half the length of the fifth section; crossvein r-m situated just beyond the end of vein R_{1+2} slightly before the middle of discal cell; ultimate section of fourth vein almost straight, last section of fifth slightly shorter than posterior crossvein. *Abdomen:* Rather distinctly gray pubescent, especially on first tergum and on margins; sides of abdomen broadest at segments two to four, tapering at segment five; fifth segment one and one half times as long as the fourth. *Hypopygium:* About three fourths as long as fifth, the longitudinal groove situated just to the left of a median line; membranous apical portion somewhat protruded (in all the specimens at hand); hypopygium strongly compressed to the right (fig. 107d). From ventral view the ninth segment is about as wide as long, with a broad 'V' shaped concavity on posterior margin, clasper rather irregular, curved inward at their apices and somewhat carinated above (fig. 107e).

Length: body and wings 1.7-2.5 mm.

Female. Upper third of front shining black, with a narrow black stripe extending down into the silvery portion. Tarsi brown, flattened and dilated. Base of ovipositor globose, piercer a little longer than base (fig. 107c) and reaching to second abdominal segment, hind trochanters normal. Usually more grayed than the males, with the wings distinctly milky white.

Type locality: King City, California (reared from beet leafhopper, *Eutettix tenellus*).

The writer has studied the type at the United States National Museum.

The large collection of Dorilaidae reared from *Eutettix tenellus* and collected on beet leafhopper hosts by C. F. Henderson and the beet leafhopper parasite studies by Dr. G. F. Knowlton, Severin, et al. proved *vagabunda* to be the main species concerned in parasitism of this major pest. This collection indicates that *vagabunda* and *Dorilas subopacus industrius* (Knab) are probably the only ones which parasitize this leafhopper in the west. These were the only species reared in the Henderson collection and with the exception of one specimen of *Tömösváryella subvirescens* were the only species taken in the sweepings on the leafhopper hosts *Salsola pestifer*, *Sofia*, et al. Specimens have been taken in *Ceanothus* and may parasitize other leafhoppers besides *E. tenellus*.

This is one of the common American species, being especially abundant in the western states. Because of its ubiquity only the state records are given here, the exact localities are perhaps of little consequence. In the order of abundance of locality records for the species are as follows: Idaho, Utah, California, Oregon, Nevada, Colorado, Wyoming, Oklahoma, Arizona, Kansas, Michigan, Saskatchewan, South Dakota, Washington, Texas, Iowa, New Mexico, Georgia, Florida, Ohio and Virginia.

Tömösváryella wilburi (Hardy)

(Plate 18, figs. 108a-e)

Pipunculus wilburi Hardy, 1939, Journ. Kans. Ent. Soc. XII, 22-23.

This species is more closely related to *utahensis* (Hardy-Knowlton) but is easily distinguished by the elongate spurlike process on the middle coxae as well as by genital characters.

Male.—Eyes joined for about one third the length of front. Antennae typical. Thorax and abdomen subshining black, lightly dusted with gray. *Leg*: Typical in color, front femora each with a pair of small flexor spines below, near bases. Middle coxae apparently with a strong spur at each of their apices; this spurlike development is actually composed of four to five long flat bristles which lie so close together that they give the appearance of a single trochanteral development (fig. 108a, b); *utahensis* has two or three narrow much shorter bristles which are distinctly separated (fig. 106b). Processes of hind trochanters rather long and acute (fig. 108c). Femoral spines weak, not at all developed except on apical third. Dorsum of thorax and humeri with scattered black hairs.

Humeri whitish yellow, halteres yellow. Wings rather typical of genus, third costal section about one third the length of fourth. Sides of abdomen almost straight, slightly widest at segments two and three. *Hypopygium*: Compressed to the right, elongated and somewhat pointed apically. No distinct longitudinal groove, the margins of the eighth sclerite apparently grown together on the dorsum, a slight depressed area toward the left side gives indication of this junction. Membranous portion distinct and usually protruded at apex (fig. 108e). Membranous portion much larger than in *utahensis*, being longer than sclerotized portion of eighth segment on left side from ventral view; the ninth segment is also longer than this portion. From ventral view the ninth sclerite is longer than wide, with a shallow concavity apically; the anal plates cover most of the bases of the claspers. Claspers rather simple, rather flattened laterally and spoonlike on inner margins (fig. 108d), more deeply excavated than in *utahensis*.

Length: body, 3.1 mm.; wing, 3.4 mm.

Female. "Front silvery to the vertex, concave in the middle. Front and middle femora with two to three stout black hairs on undersides near bases; post-trochanters with a small clump of short, black hairs beneath. Piercer of ovipositor slender, reaching past posterior margin of second segment, gradually tapering from its globose base."

Type locality: Manhattan, Kansas.

Type at Kansas State College.

This species is very abundant in the middle west and is known from the following states: Colorado, Iowa, Kansas, Missouri, New Mexico and Wyoming.

Tömösváryella xerophila n. sp.

(Plate 18, figs. 109a-e)

This species is related to *vagabunda* but differs from all other species in this complex by having the male harpagones bluntly tipped, rounding apically, simple in shape without dorsal carinae or concave inner margins and the apical cleft of ninth segment very shallow. The very short junction of the compound eyes is also characteristic.

Male. Small, subshining and chiefly bare species. *Head*: Just a few of the facets of eyes touching on the upper portion of the front, eyes otherwise separated; frontal triangle and face silvery pubescent, upper portion of front shining black; antennae black,

third segment acuminate (fig. 109a), rather densely white fringed below; mouthparts yellow. *Thorax*: Shining black in ground color, lightly dusted with brown on the dorsum, faintly grayed on pleurae and margins of mesonotum and scutellum; metanotum more cinereous, with faint indication of a transverse furrow; dorsocentral and marginal hairs strong, a prominent row of yellow hairs on anterior margin of mesonotum. *Legs*: Typical of the genus in coloration, hind trochanters each with a moundlike development beneath, near apical portion (fig. 109b); middle coxae with weak apical bristles; front femora each with a pair of moderately strong flexor bristles near bases, below. *Wings*: Rather typical, broadly rounding, third section of costa about one third the length of fourth; fifth section twice as long as third and fourth combined; crossvein r-m somewhat oblique, situated just beyond the middle of discal cell and at about middle of third costal section; ultimate section of fourth vein slightly sinuate. *Abdomen*: Subshining in ground color but rather thickly grayish pruinose; sides almost straight but slightly wider at segments three to four. *Hypopygium*: Evenly compressed to the right, a little more than three fourths the length of the fifth abdominal segment; the longitudinal membranous area is situated at about the middle on the dorsum (fig. 109d). From ventral view the eighth segment is rather elongate with an extensive membranous portion. The ninth segment is about as wide as long and its length is about equal to that of the sclerotized portion of the eighth on the left side; apical cleft of ninth segment very shallow and broadly "V" shaped. Harpagones simple, rather broad and rounded apically (fig. 109e).

Length: body and wings 2.4 mm.

Female. Third segments of antennae yellowish; front broad, somewhat concave at median portion, entirely silvery. Base of ovipositor subglobose; piercer long and slender, reaching to about posterior margin of second abdominal segment and almost twice as long as its base (fig. 109c); there is no line of articulation separating the piercer from its base.

Holotype ♂: Cuervo, New Mexico, June 23, 1940, (D. E. Hardy); allotype ♀ same data as type. Thirty-nine paratypes, twenty-nine ♂♂ and ten ♀♀ from the following localities: Same as type (R. H. Beamer, L. C. Kuitert, D. E. Hardy); Chiricahua Mountains, Arizona, Rustlers Park, July 5, 1940 (D. E. Hardy); Olancha, California, August 25, 1940 (D. E. Hardy); Amarillo, Texas, July 7, 1927 (L. D. Anderson); Romero, Texas,

June 22, 1940 (D. E. Hardy). All are in the Snow Entomological Collection.

Most all the specimens in the type series were taken in a typical desert habitat by sweeping short clump grass. Leafhoppers of the genus *Athysanella* were abundant and may serve as the host for this species.

INDEX TO GENERIC AND SPECIFIC NAMES

	PAGE
abberatus (Hardy-Knowlton), <i>Dorilas</i>	63
aculeatus Williston, <i>Dorilas</i> ; = <i>willistoni</i> (Kertész) c.n.*.....	126
acuminata (Cresson), <i>Cephalosphaera</i>	42
aequus (Cresson), <i>Dorilas</i>	64
aequus var. <i>argyrofrons</i> (Hardy-Knowlton).....	66
aequus var. <i>longipes</i> (Hardy-Knowlton).....	66
affinis (Cresson), <i>Dorilas</i>	67
agnescens Hardy, <i>Tömösváryella</i>	149
albiseta Cresson, <i>Tömösváryella</i> ; syn. of <i>subvirescens</i> (Lw.).....	178
albofasciatus Hough, <i>Dorilas</i> ; syn. of <i>reipublicae</i> (Walker).....	110
<i>Allomethus</i> n. genus.....	128
<i>Alloneura</i> Rondani, syn. of <i>Dorilas</i> (Meigen).....	55
alpinus (Cresson), <i>Dorilas</i>	68
alternatus (Cresson), <i>Dorilas</i>	69
<i>Anacephalops</i> Aczel	128
angus (Cresson), <i>Dorilas</i>	71
apicalis (Hardy-Knowlton), <i>Dorilas</i>	71
appendiculata (Cresson), <i>Cephalosphaera</i>	43
appendipes (Cresson), <i>Tömösváryella</i>	150
aquavicius n. sp., <i>Dorilas</i>	72
aridus Williston, <i>Tömösváryella</i> ; syn. of <i>subvirescens</i> (Loew).....	178
armata Hardy, <i>Tömösváryella</i>	152
<i>Ateleneura</i> Macquart, syn. of <i>Chalarus</i> Walker.....	32
ater (Meigen), <i>Dorilas</i>	74
ater var. <i>velutinus</i> (Cresson).....	76
atlanticus (Hough), <i>Dorilas</i>	77
atramontensis (Banks), <i>Dorylomorpha</i>	132
atramontensis occidents (Hardy), = <i>occidentis</i> Hardy, raised to species.....	139
auctus (Fallen), <i>Prothechus</i>	27
baltica Carpenter-Hull, <i>Cephalosphaera</i>	24
<i>banksi</i> (Aczel), <i>Dorilas</i> ; c.n. for <i>terminalis</i> Banks.....	78
<i>banksi</i> Hardy, <i>Dorilas</i> ; just a mms. name.....	78
<i>beameri</i> Hardy, <i>Tömösváryella</i>	153
<i>Beckerias</i> Aczel	127
<i>bidactylus</i> n. sp., <i>Dorilas</i>	80
<i>bidens</i> (Cresson), <i>Tömösváryella</i>	153
<i>biscaynei</i> (Cresson), <i>Cephalosphaera</i>	45

	PAGE
brachystigmaticus (Hardy-Knowlton), Dorilas; = stigmaticus brachystigmaticus (Hardy-Knowlton)	115
brevijuncta n. sp., Tömösváryella	155
brevis (Cresson), Cephalosphaera	46
brimleyi n. sp., Allomethus	128
campestris Verrall, Dorilas; syn. of ater (Meigen)	74
canadensis n. sp., Dorylomorpha	133
caudatus (Cresson), Dorilas	81
caudatus var. discolor (Banks)	82
caudelli (Malloch), Dorylomorpha	135
Cephalops Fallen, syn. of Dorilas Meigen	55
Cephalosphaera Enderlein	40
Charlarus Walker	32
chiloensis Collin, Protonephrocercus	37
cinctus (Banks), Dorilas	83
cinctus subtilis n. sub. sp.	84
cingulatus Loew, Dorilas; syn. of ater (Meigen)	74
cingulatus Cresson (nec Loew), Dorilas; syn. of fuscus Loew	88
cingulatus var. velutinus (Cresson), = ater var. velutinus (Cresson)	76
Claraeola Aczel	127
collini Carpenter-Hull, Protonephrocercus	24
Collinias Aczel	127
columbiana (Kertész), Tömösváryella; = c. n. for trochanteratus Malloch,	156
confraternus Banks, Dorilas; syn. of subopacus (Loew)	117
confraternus var. melanis Hardy-Knowlton, syn. of subopacus industrius (Knab)	119
constricta (Banks), Cephalosphaera	48
contorta (Hardy), Tömösváryella	157
coquilletti (Kertész), Tömösváryella	159
coquilletti var. flaviantenna (Hardy-Knowlton)	160
cressoni Johnson, Dorilas; = minor cressoni (Johnson)	104
csikii (Aczel), Prothechus; c. n. for opacus Williston	28
curtus n. sp., Dorilas	85
daeckei Johnson, Nephrocercus	38
dentipes Meigen, Dorilas; syn. of ater (Meigen)	74
discolor Banks, Dorilas; = caudatus var. discolor (Banks)	82
dispar Zetterstedt, Dorilas; = ater (Meigen)	74
dissimilis n. sp., Tömösváryella	161
Dorilas Meigen	55
Dorylas Kertész, = Dorilas Meigen	55
Dorylomorpha Aczel	131
dubius Cresson, Dorilas; syn. of nigripes (Loew)	107
elegantula (Williston), Cephalosphaera	50
eronis Curran, Cephalosphaera; syn. of brevis (Cresson)	46
Eudorylas Aczel, = Dorilas (Eudorylas) Aczel	55
exilidens n. sp., Tömösváryella	162
exilis (Malloch), Dorylomorpha	136
extinctus (Meunier), Prothechus	24
fasciata (Hardy), Jassidophaga	29

fasciatus Loew, Dorilas; loewii (Kertesz) is c. n.....	101
femoratus Cresson, Dorilas; syn. of houghii (Kertesz).....	92
flavicornis (Williston), Allomethus.....	129
flavitaris (Williston), Dorilas	86
flavomaculata (Hough), Dorylomorpha.....	137
floridensis Hardy, Tömösváryella	164
florissantius Carpenter-Hull, Protonephrocerus.....	24
fuscitarsis (Adams), Dorilas	87
fuscus Cresson (nec Loew), Dorilas; syn. of ater (Mg.).....	74
fuscus (Loew), Dorilas	88
fuscus var. nitidiventris (Loew).....	89
germanica Aezel, Cephalosphaera	41
globosus Cresson, Dorilas; syn. of affinis (Cresson).....	67
grandis n. sp., Dorilas	90
harmstoni (Hardy-Knowlton), Dorilas.....	92
hirticollis Becker Tömösváryella; syn. of subvirescens (Loew).....	178
horvathi Kertesz, Dorilas; syn. of ater (Meigen).....	74
houghii (Kertesz), Dorilas	92
houghii var. apicarinus (Hardy-Knowlton).....	94
houghii var. curvitibiae (Hardy).....	94
houghii Cresson (nec Kertesz), Dorilas; syn. of pallipes (Johnson).....	109
huachucanus n. sp. Dorilas	95
inconspicua (Malloch), Tömösváryella	165
industrius (Knab), Dorilas; = subopacus industrius (Kn.).....	119
insularis Cresson, Tömösváryella; syn. of subvirescens (Loew).....	178
Jassidophaga Enderlein	29
kansensis Hardy, Dorilas	97
knowltoni Hardy, Tömösváryella; syn. of subvirescens (Loew).....	178
lasiofemoratus (Hardy-Knowlton), Dorilas	98
latifrons n. sp., Chalarus	33
lateralis Walker, Dorilas; houghii (Kertesz) is c. n.....	92
latipennis (Banks), Dorilas	99
lautus n. sp., Dorilas	99
lepidipes n. sp., Tömösváryella	166
loewii (Kertesz), Dorilas; c. n. for fasciatus Loew.....	101
luteicornis (Cresson), Dorilas	102
mainensis (Cresson), Dorilas; = varius var. mainensis (Cresson).....	124
maxima n. sp., Cephalosphaera	50
metallescens Malloch, Tömösváryella; syn. of subvirescens (Loew).....	178
Microcera Meigen, syn. of Dorilas Meigen.....	55
minacis Hardy, Tömösváryella.....	167
minor (Cresson), Dorilas	103
minor cressoni (Johnson).....	104
montivagus n. sp., Dorilas	104
Nephrocerus Zetterstedt	37
nevadaensis n. sp., Dorilas	106
nigricornis Adams, Dorilas; syn. of loewii (Kertesz).....	101
nigripes (Loew), Dorilas.....	107
nitidiventris (Loew), Dorilas; = fuscus var. nitidiventris (Loew).....	89

	PAGE
<i>occidens</i> (Hardy), <i>Dorylomorpha</i>	139
<i>occidentalis</i> Malloch, <i>Dorilas</i> ; syn. of <i>subopacus</i> (Lw.).....	117
<i>oligocenicus</i> Carpenter-Hull, <i>Nephrocerus</i>	24
<i>opacus</i> Williston, <i>Prothechus</i> ; = <i>csikii</i> Aczel is c.n.....	28
<i>ornata</i> n. sp., <i>Dorylomorpha</i>	139
<i>pallipes</i> (Johnson), <i>Dorilas</i>	109
<i>pauca</i> n. sp., <i>Tömösváryella</i>	168
<i>pilosa</i> (Zetterstedt), <i>Jassidophaga</i>	31
<i>pilosiventris</i> Becker, <i>Tömösváryella</i> ; syn. of <i>subvirescens</i> (Loew).....	178
<i>Pipunculus</i> Latreille, syn. of <i>Dorilas</i> Mg.....	55
<i>politus</i> (Williston), <i>Tömösváryella</i>	146
<i>propinqua</i> n. sp., <i>Tömösváryella</i>	169
<i>Prothechus</i> Rondani	26
<i>Protonephrocerus</i> Colln	37
<i>proximus</i> Cresson, <i>Tömösváryella</i> ; syn. of <i>coquilletti</i> (Kertész).....	159
<i>proximus</i> flaviantennus Hardy-Knowlton, = <i>coquilletti</i> flaviantenna (Hardy-Knowlton)	160
<i>quadridentis</i> n. sp., <i>Tömösváryella</i>	172
<i>reipublicae</i> (Walker), <i>Dorilas</i>	110
<i>sabroskyi</i> n. sp., <i>Dorilas</i>	112
<i>sachtlebeni</i> (Aczel), <i>Tömösváryella</i> ; c.n. for <i>unguiculatus</i> Cresson.....	173
<i>scoparius</i> Cresson, <i>Tömösváryella</i> ; syn. of <i>sylvatica</i> (Mg.).....	180
<i>semifasciatus</i> Cresson, <i>Dorilas</i> ; syn. of <i>loewii</i> (Kertész).....	101
<i>similis</i> (Hough), <i>Tömösváryella</i>	174
<i>slossonae</i> Johnson, <i>Nephrocerus</i>	39
<i>sonorensis</i> (Cole), <i>Tömösváryella</i>	176
<i>sororius</i> Cresson, <i>Dorilas</i> ; syn. of <i>fuscus</i> var. <i>nitidiventris</i> Loew.....	89
<i>spurius</i> (Fallen), <i>Chalarus</i>	36
<i>stainsi</i> n. sp., <i>Dorilas</i>	113
<i>stigmaticus</i> (Malloch), <i>Dorilas</i>	114
<i>stigmaticus</i> brachystigmaticus (Hardy-Knowlton).....	115
<i>stricklandi</i> (Curran), <i>Cephalosphaera</i>	52
<i>subnitens</i> (Cresson), <i>Tömösváryella</i>	177
<i>subopacus</i> (Loew), <i>Dorilas</i>	117
<i>subopacus</i> industrius (Knab).....	119
<i>subvirescens</i> (Loew), <i>Tömösváryella</i>	178
<i>succinius</i> (Meunier), <i>Prothechus</i>	24
<i>sylvatica</i> (Meigen), <i>Tömösváryella</i>	180
<i>tarsalis</i> (Banks), <i>Dorilas</i>	120
<i>terminalis</i> Banks, <i>Dorilas</i> ; = <i>banksi</i> Aczel c.n.....	78
<i>tibialis</i> n. sp., <i>Cephalosphaera</i>	53
<i>Tömösváryella</i> Aczel	144
<i>townsendi</i> Malloch, <i>Dorilas</i> ; syn. of <i>ater</i> Meigen.....	74
<i>toxodentis</i> (Hardy-Knowlton), <i>Tömösváryella</i>	181
<i>translatus</i> (Walker), <i>Tömösváryella</i> ; doubtful position.....	178
<i>trichaetus</i> (Malloch), <i>Dorilas</i>	121
<i>tridentata</i> n. sp., <i>Dorylomorpha</i>	141
<i>trochanteratus</i> Malloch, <i>Tömösváryella</i> ; = <i>columbianus</i> (Kert.) c.n.....	156
<i>trochanteratus</i> tenellus Hardy-Knowlton, syn. of <i>vagabunda</i> (Knab).....	185

	PAGE
tumida Hardy, Tömösváryella.....	181
turgida Hardy, Tömösváryella.....	183
uncinata n. sp., Dorylomorpha.....	142
unguiculatus Cresson, Tömösváryella; = sachtlebeni (Loew) c.n.....	173
utahensis (Hardy-Knowlton), Tömösváryella.....	184
vagabunda (Knab), Tömösváryella.....	185
varius (Cresson), Dorilas.....	122
varius var. mainensis (Cresson).....	124
varius var. phaethus (Hardy-Knowlton).....	124
Verrallia Mik, isogenotypic syn. of Prothechus Rond.....	26
viduus Cresson, Dorilas; syn. of fuscus var. nitidiventris (Loew).....	89
vierecki (Malloch), Dorilas.....	125
virginica Banks, Prothechus, syn. of auctus (Fall.).....	27
wilburi (Hardy), Tömösváryella.....	187
willistoni (Kertész), Dorilas; c.n. for aculeatus Will.....	126
winnamannae Malloch, Dorilas; syn. of nigripes (Lw.).....	107
wolffi Kowarz, Dorilas; syn. of ater Meigen.....	74
xanthopodus (Williston), Allomethus.....	130
xerophila n. sp., Tömösváryella.....	188

PLATE I

FIG. 1. *Dorilas ater* (Meigen). a. mouthparts, lateral view; lab. = labellum, ha. = haustellum, lbr. = labrum, ros. = rostrum, mx. p. = maxillary palpus, ap. = apodeme, thy. = thyroid (mentum).

FIG. 2. *Tömösváryella wilburi* (Hardy). a. mouthparts, lateral view; b. mentum (thyroid), ventral view; c. maxillary palpus; d. last three subsegments of tarsus and pretarsus of middle leg, emp. = empodium, cl. = claw, pul. = pulvilli, aux. = auxilae, ung. = ungitractor; e. male genitalia, dorsal view showing muscles of left harpagone; f. aedeagus and its musculature, dorsal view of left side, diagrammatic.

FIG. 3. *Dorilaidae* sp.? a. larva from *Erythroneura* sp.?, anterior end; b. *Tömösváryella vagabunda* (Knab), mandible of last instar larva from *Eutettix tenellus* (Baker).

FIG. 4. Stigmal areas of *Dorilaidae* larvae. a. *Dorilaidae* sp.? from *Ballana* sp.?, posterior area of last instar; b. same larva as a., anterior area; c. *Dorilaidae* sp. from *Gypona* sp.?, posterior stigmal area; d. *Dorilaidae* sp.?, posterior area of last instar larva from *Ophiola* sp.?

FIG. 5. *Prothecchus auctus* (Fallen). a. antenna; b. wing; c. abdomen of male, dorsal view.

FIG. 6. *Jassidophaga fasciata* (Hardy). a. antenna. b. male hypopygium, dorsal view; c. female ovipositor, dorsal view; d. female ovipositor and posterior portion of abdomen, lateral view.

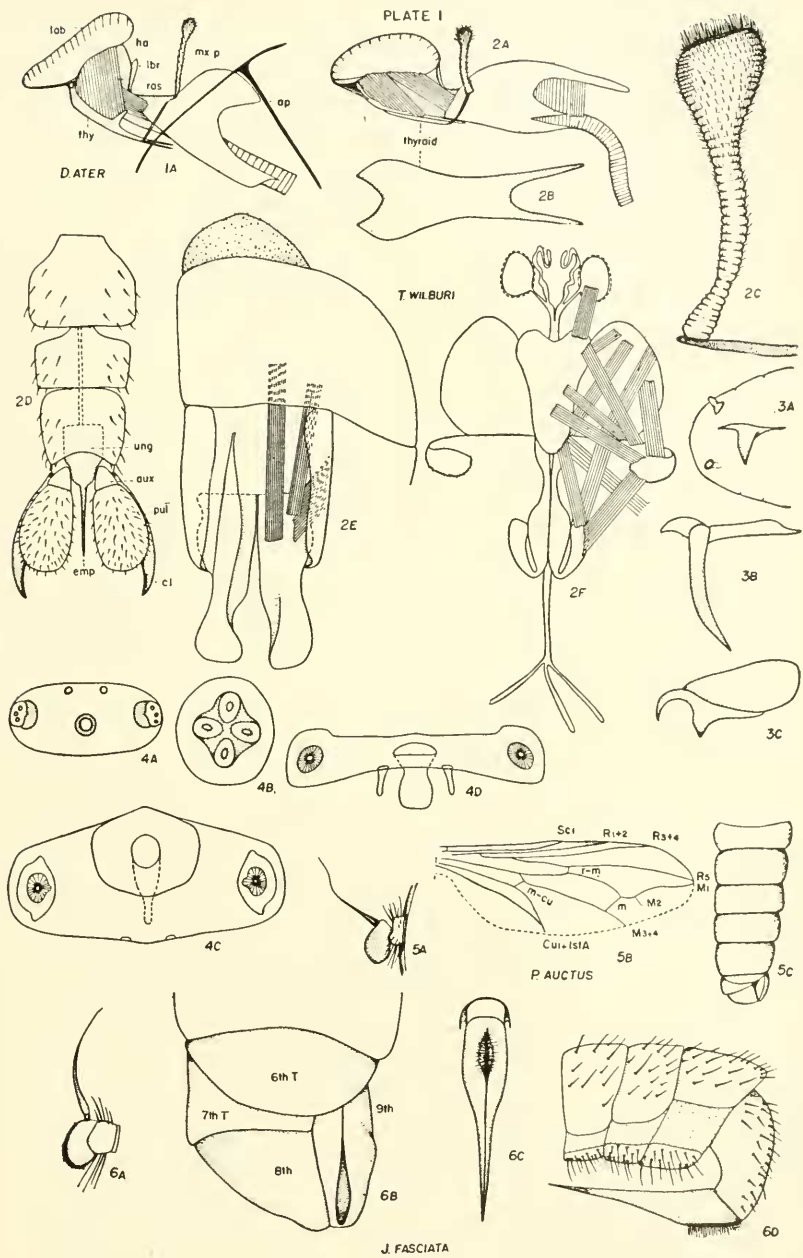


PLATE II

FIG. 7. *Jassidophaga pilosa* (Zetterstedt). a. male hypopygium, dorsal view; b. wing; c. female abdomen, lateral view.

FIG. 8. *Chalarus latifrons* n. sp. a. antenna; b. male hypopygium, dorsal view; c. hypopygium, ventral view.

FIG. 9. *Chalarus spurius* (Fallen). a. head, lateral view; b. wing; c. male hypopygium, ventral view; d. hypopygium, dorsal view; e. harpagones, lateral view; f. female abdomen, lateral view; g. ovipositor, dorsal view.

FIG. 10. *Nephrocerus daccke*i Johnson. a. head, lateral view; b. wing; c. female ovipositor, lateral view.

FIG. 11. *Cephalosphaera acuminata* (Cresson). a. antenna; b. hind tibia, male; c. female ovipositor, lateral view; d. male hypopygium, ventral.

FIG. 12. *C. appendiculata* (Cresson). a. antenna; b. posterior tibia of male; c. middle tibia; d. female ovipositor, lateral view; e. male hypopygium, lateral view; f. hypopygium, dorsal; g. hypopygium, ventral; h. wing.

PLATE 2

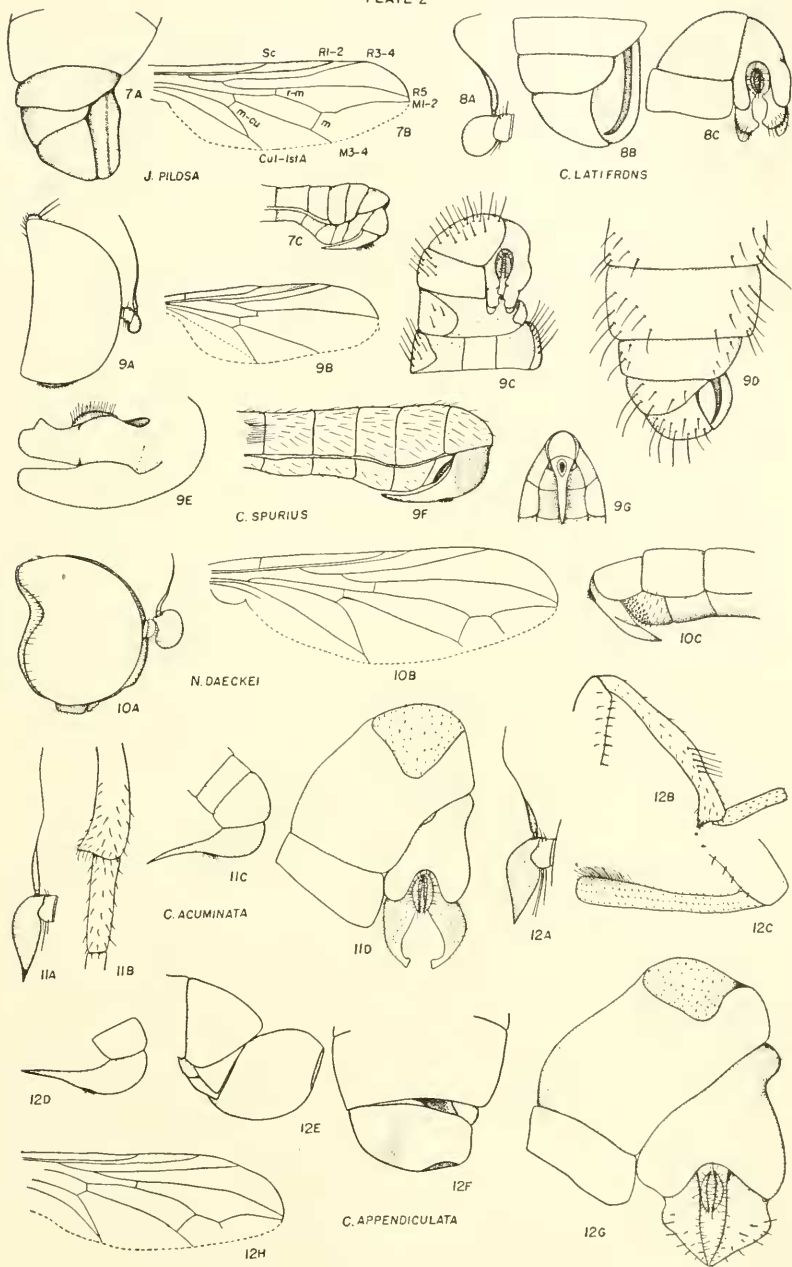


PLATE III

FIG. 13. *C. biscaynei* (Cresson). a. antenna; b. wing; c. female abdomen, lateral view; d. male abdomen, dorsal view.

FIG. 14. *C. brevis* (Cresson). a. antenna; b. wing; c. male abdomen, dorsal; d. female ovipositor, lateral.

FIG. 15. *C. constricta* (Banks). a. antenna; b. wing; c. female abdomen, lateral; d. male abdomen, dorsal; e. male hypopygium, ventral view.

FIG. 16. *C. maxima* n. sp. a. antenna; b. wing; c. male hypopygium, lateral; d. hypopygium, dorsal; e. female ovipositor, lateral; f. hypopygium, ventral.

FIG. 17. *C. tibialis* n. sp. a. antenna; b. posterior tibia of male; c. costal margin of wing; d. male hypopygium, ventral; e. hypopygium, dorsal; f. female ovipositor, lateral.

PLATE 3

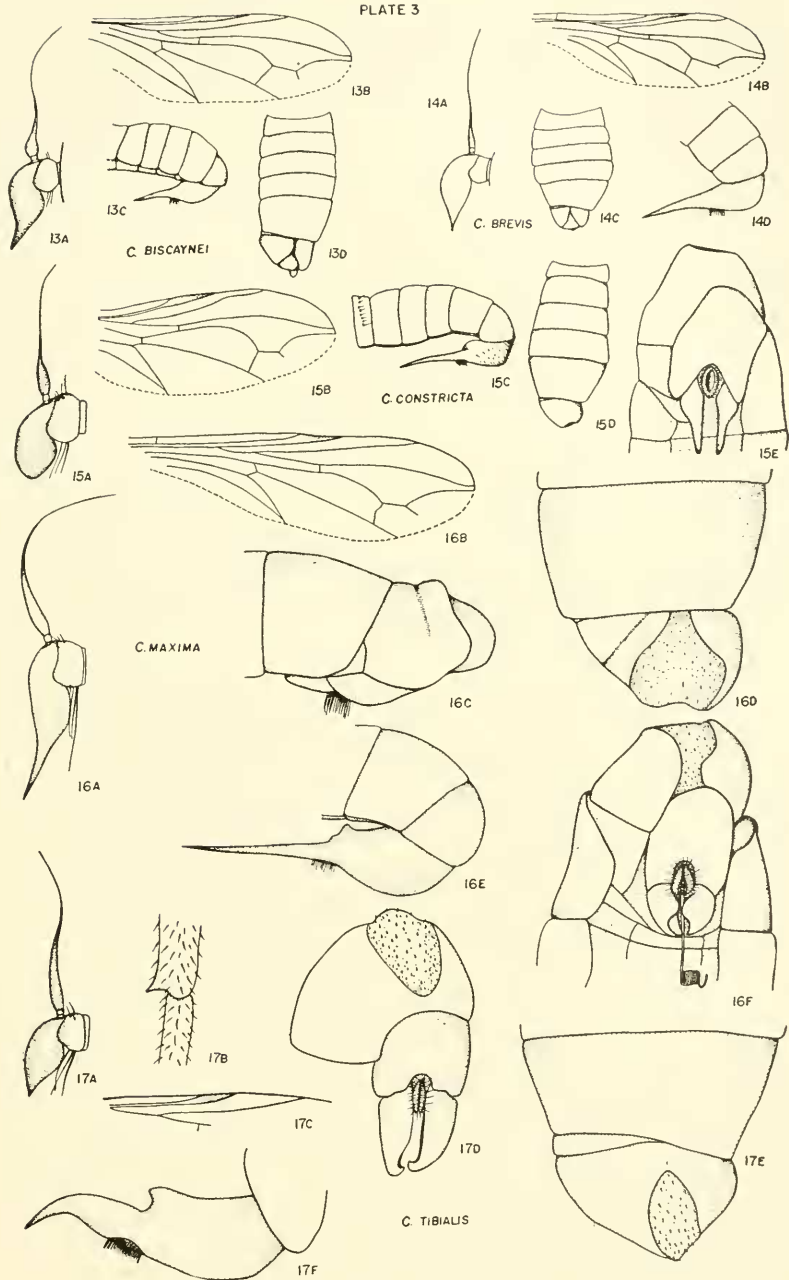


PLATE IV

Fig. 18. *C. stricklandi* (Curran). a. male hypopygium, dorsal.

Fig. 19. *Dorilas abberatus* (Hardy-Knowlton). a. antenna; b. wing; c. female abdomen, lateral.

Fig. 20. *D. aequus* (Cresson). a. antenna; b. male hypopygium, dorsal; c. hypopygium, lateral; d. female ovipositor, lateral; e. ovipositor, dorsal.

Fig. 21. *D. aequus* var. *argyrofrons* (Hardy-Knowlton). a. male hypopygium, dorsal; b. male hypopygium, ventral; c. female ovipositor.

Fig. 22. *D. aequus* var. *longipes* (Hardy-Knowlton). a. female ovipositor.

Fig. 23. *D. affinis* (Cresson). a. antenna; b. wing; c. female ovipositor, lateral; d. ovipositor, dorsal; e. male hypopygium, dorsal; f. hypopygium, ventral.

Fig. 24. *D. alpinus* (Cresson). a. antenna; b. female abdomen, lateral.

Fig. 25. *D. alternatus* (Cresson). a. antenna, male; b. antenna, female; c. male hypopygium, dorsal.

Fig. 26. *D. angus* (Cresson). a. female ovipositor, lateral.

Fig. 27. *D. apicalis* (Hardy-Knowlton). a. antenna; b. wing, costal margin; c. male hypopygium, dorsal.

PLATE 4

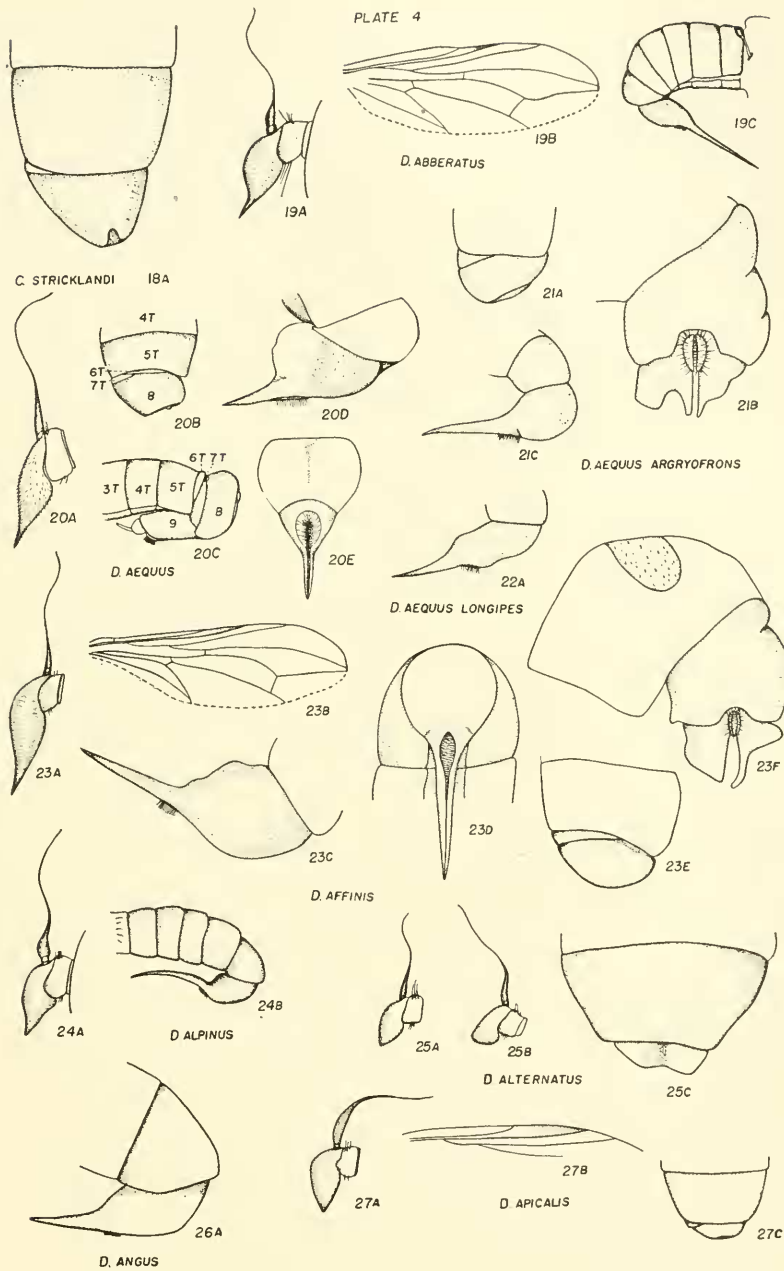


PLATE V

FIG. 28. *D. aquavicius* n. sp. a. antenna; b. male hypopygium, ventral; c. inner harpagone, lateral; d. female ovipositor, lateral; e. sixth sclerite of male; f. hypopygium, dorsal.

FIG. 29. *D. ater* (Meigen). a. antenna; b. wing; c. male hypopygium, ventral; d. hypopygium, dorsal; e. male abdomen, lateral; f. female abdomen, lateral.

FIG. 30. *D. atlanticus* (Hough). a. antenna; b. wing; c. female ovipositor, lateral; d. male abdomen, lateral; e. sixth sclerite of male; f. male abdomen, dorsal; g. female ovipositor, dorsal.

FIG. 31. *D. banksi* (Aczel). a. antenna; b. wing; c. female ovipositor, lateral; d. male abdomen, dorsal.

FIG. 32. *D. bidactylus* n. sp. a. antenna; b. male hypopygium, dorsal; c. male hypopygium, ventral.

FIG. 33. *D. caudatus* (Cresson). a. wing; b. male abdomen, dorsal view.

PLATE 5

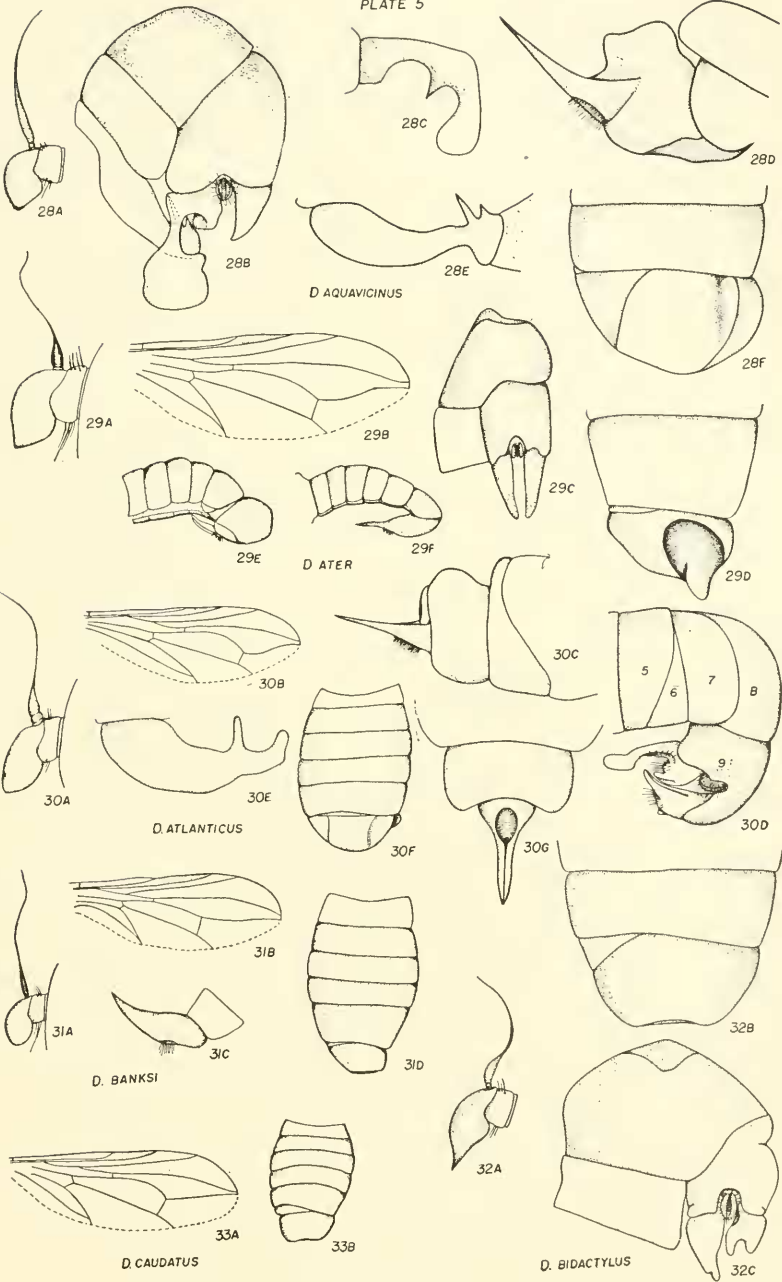


PLATE VI

FIG. 33. *D. caudatus* (Cresson). c. male hypopygium, ventral.

FIG. 34. *D. caudatus* var. *discolor* (Banks). a. antenna; b. female ovipositor, lateral.

FIG. 35. *D. cinctus* (Banks). a. antenna; b. wing; c. male hypopygium, ventral; d. hypopygium, dorsal.

FIG. 36. *D. cinctus subtilis* n. sub. sp. a. male hypopygium, ventral; b. female ovipositor, lateral.

FIG. 37. *D. curtus* n. sp. a. antenna; b. costal margin of wing; c. male hypopygium, lateral; d. hypopygium, dorsal; e. hypopygium, ventral.

FIG. 38. *D. fuscitarsus* (Adams). a. antenna; b. wing; c. male hypopygium, dorsal.

FIG. 39. *D. fuscus* (Loew). a. antenna; b. wing; c. male hypopygium, ventral; d. hypopygium, dorsal.

FIG. 40. *D. fuscus* var. *nitidiventris* (Loew). a. female ovipositor, lateral; b. male hypopygium, dorsal; c. hypopygium, ventral.

PLATE 6

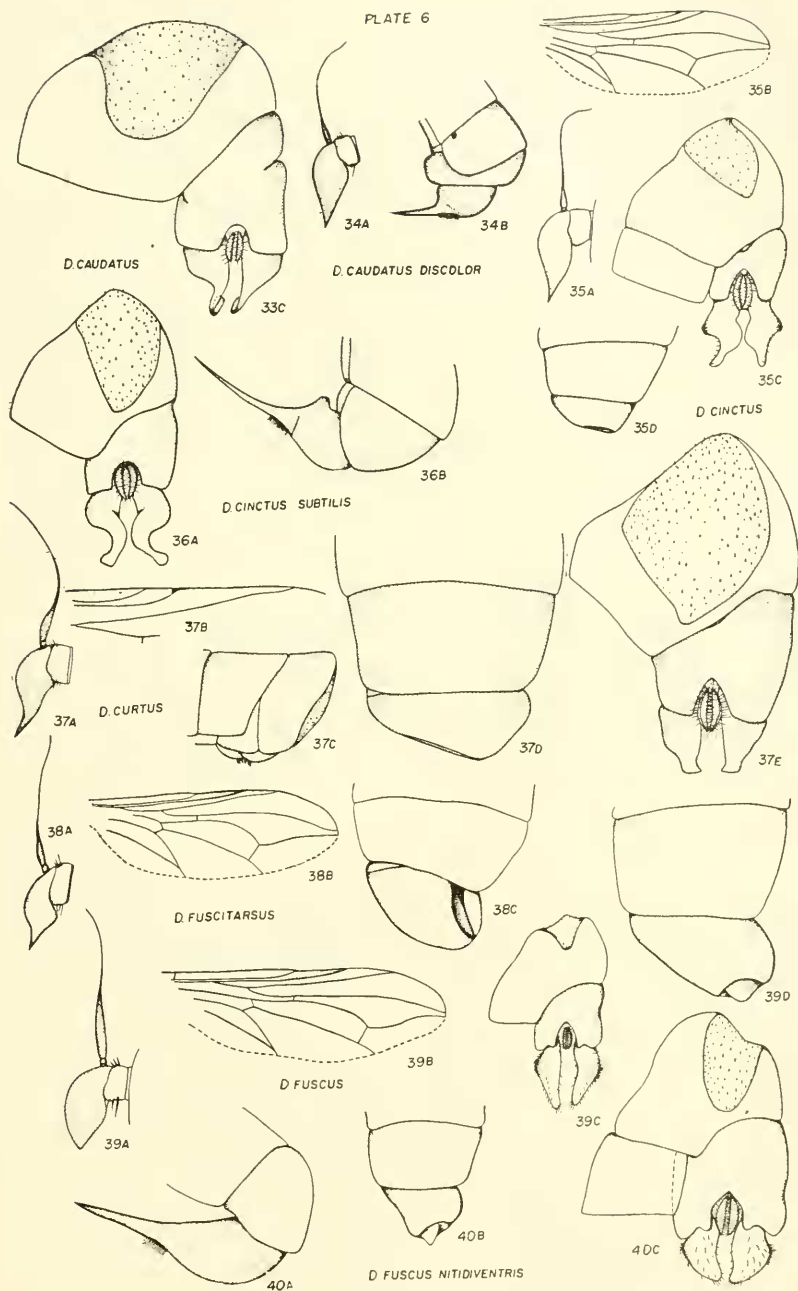


PLATE VII

FIG. 41. *D. grandis* n. sp. a. antenna; b. wing; c. male hypopygium, lateral; d. hypopygium, ventral; e. hypopygium, dorsal; f. female ovipositor, lateral.

FIG. 42. *D. harmstoni* (Hardy-Knowlton). a. antenna; b. male hypopygium, dorsal.

FIG. 43. *D. houghii* (Kerteszi). a. antenna; b. wing; c. female ovipositor, lateral; d. male abdomen, dorsal.

FIG. 44. *D. houghii apicarinus* (Hardy-Knowlton). a. costal margin of wing; b. male hypopygium, dorsal.

FIG. 45. *D. huachucanus* n. sp. a. antenna; b. male hypopygium, dorsal; c. inner harpagone, extended; d. female ovipositor, lateral; e. ovipositor, dorsal; f. male hypopygium, lateral; g. hypopygium, ventral.

FIG. 46. *D. kansensis* Hardy. a. wing, costal margin, b. male hypopygium, dorsal.

FIG. 47. *D. lasiofemoratus* (Hardy-Knowlton). a. antenna; b. costal margin of wing; c. male hypopygium, dorsal.

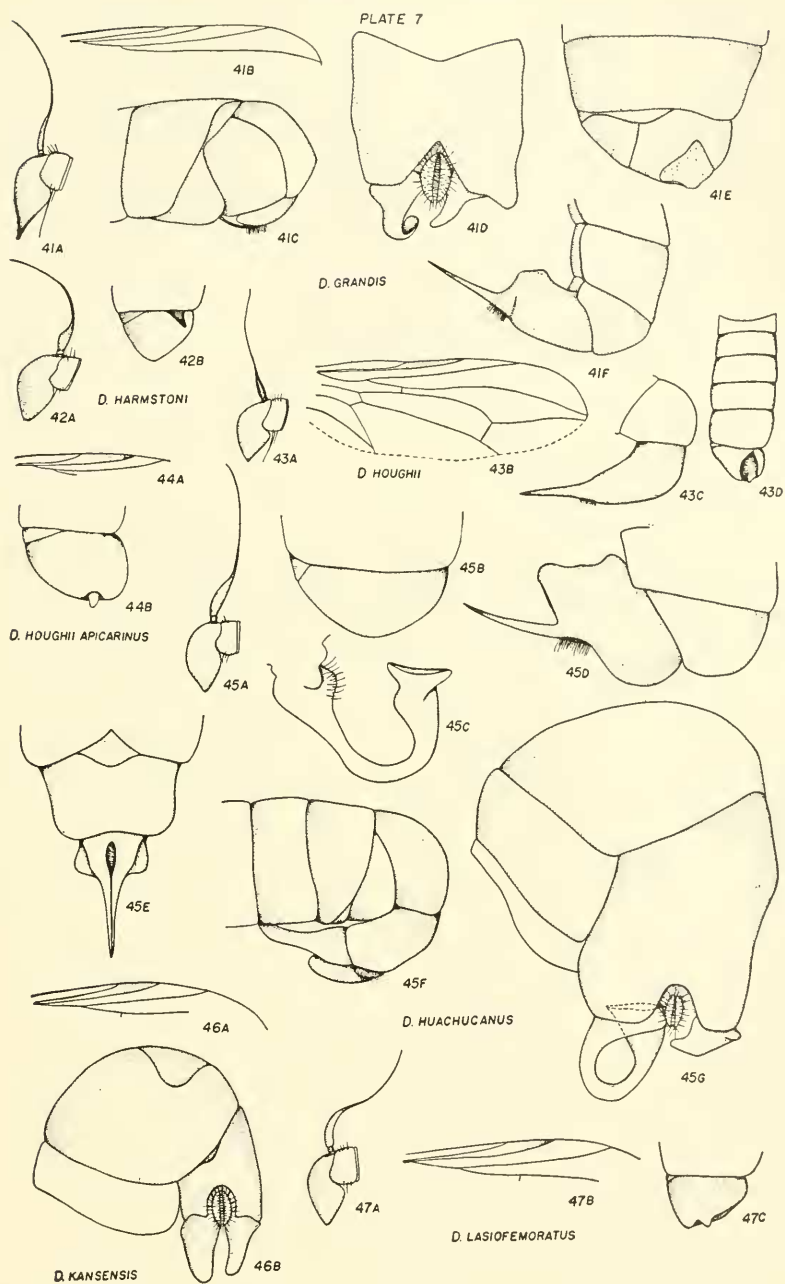


PLATE VIII

FIG. 48. *D. latipennis* (Banks). a. antenna; b. wing; c. female ovipositor, lateral.

FIG. 49. *D. lautus* n. sp. a. antenna; b. female ovipositor and posterior segments of abdomen, lateral; c. ovipositor, dorsal; d. male hypopygium, ventral; e. hypopygium, dorsal.

FIG. 50. *D. locvii* (Kertész). a. abdomen of female, lateral; b. male hypopygium, ventral; c. antenna; d. wing; e. male abdomen, dorsal.

FIG. 51. *D. luteicornis* (Cresson). a. antenna; b. wing; c. female abdomen, lateral view.

FIG. 52. *D. minor* (Cresson). a. antenna; b. wing; c. female abdomen, lateral; d. female ovipositor, dorsal; e. male abdomen, dorsal; f. hypopygium, lateral.

FIG. 53. *D. montivagus* n. sp. a. antenna; b. wing; c. male hypopygium, ventral; d. hypopygium, dorsal; e. female ovipositor, lateral.

PLATE 8

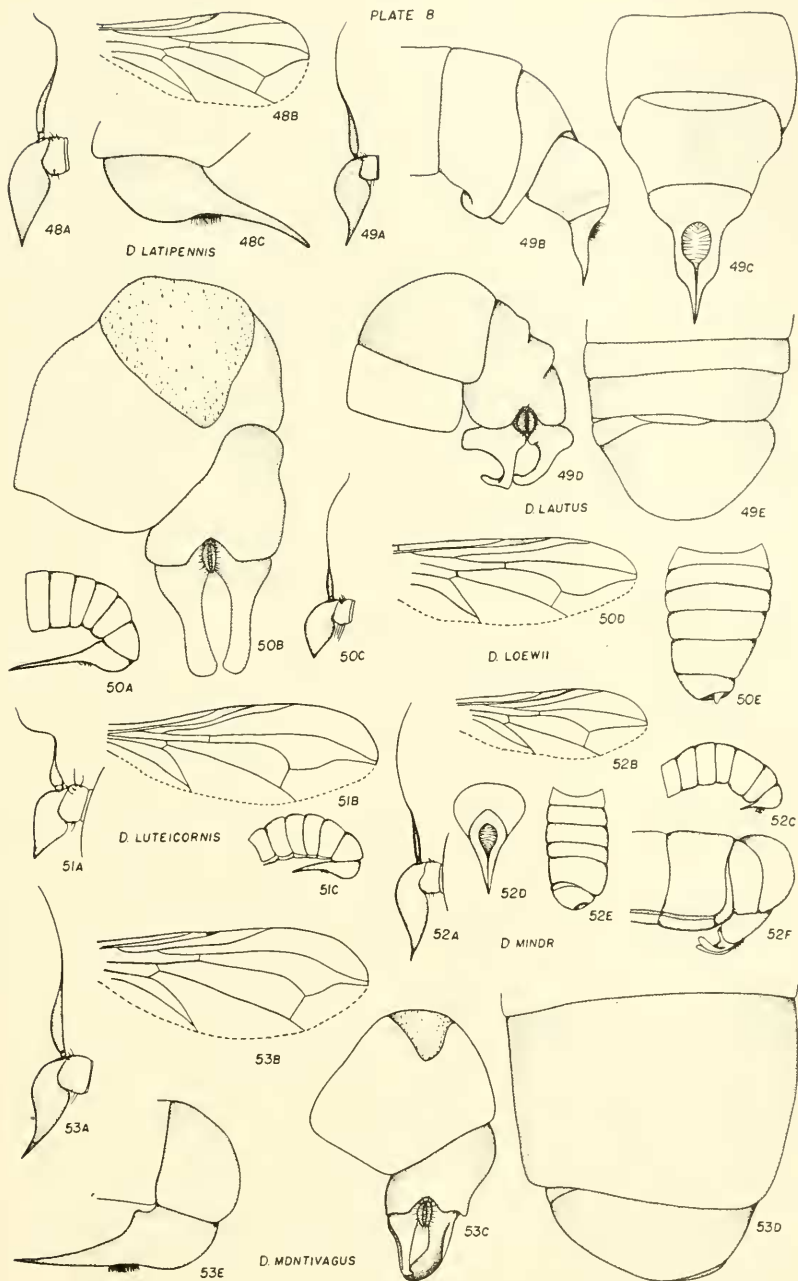


PLATE IX

FIG. 54. *D. nevadaensis* n. sp. a. antennae; b. female ovipositor, lateral; c. wing; d. male hypopygium, dorsal; e. hypopygium, lateral; f. hypopygium, ventral.

FIG. 55. *D. nigripes* (Loew). a. antenna; b. male hypopygium, dorsal; c. female abdomen, lateral; d. wing.

FIG. 56. *D. pallipes* (Johnson). a. antenna; b. wing; c. female ovipositor, lateral; d. ovipositor, dorsal; e. male hypopygium, dorsal; f. hypopygium, ventral.

FIG. 57. *D. reipublicae* (Walker). a. antenna; b. wing; c. female ovipositor, lateral; d. male hypopygium, lateral; e. abdomen, dorsal.

FIG. 58. *D. sabroskyi* n. sp. a. antenna; b. wing; c. female ovipositor, lateral; d. ovipositor, dorsal; e. male hypopygium, dorsal; f. hypopygium, ventral.

PLATE 9

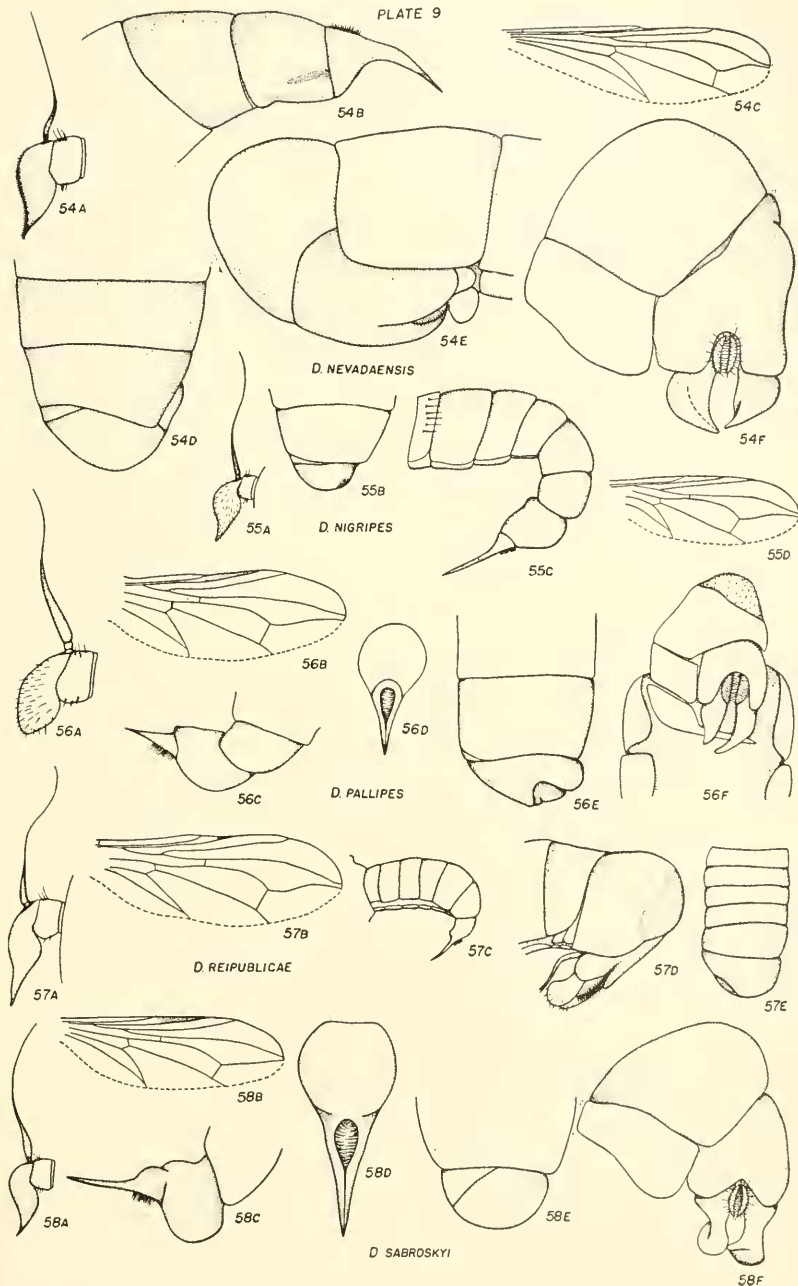


PLATE X

FIG. 59. *D. stansii* n. sp. a. antenna; b. male hypopygium, ventral; c. hypopygium, dorsal.

FIG. 60. *D. stigmaticus* (Malloch). a. antenna; b. costal margin of wing, male; c. wing, female; d. male hypopygium, dorsal view.

FIG. 61. *D. stigmaticus brachystigmaticus* (Hardy-Knowlton). a. antenna; b. male abdomen, dorsal; c. female ovipositor, lateral; d. ovipositor, dorsal; e. male hypopygium, ventral; f. wing; g. hypopygium, lateral.

FIG. 62. *D. subopacus* (Loew). a. antenna; b. posterior portion of female abdomen, ventral; c. male abdomen, dorsal; d. wing; e. male hypopygium, ventral.

FIG. 63. *D. subopacus industrius* (Knab). a. female ovipositor, lateral.

FIG. 64. *D. tarsalis* (Banks). a. antenna; b. wing; c. ninth segment and harpagones, ventral; d. male abdomen, dorsal.

PLATE 10

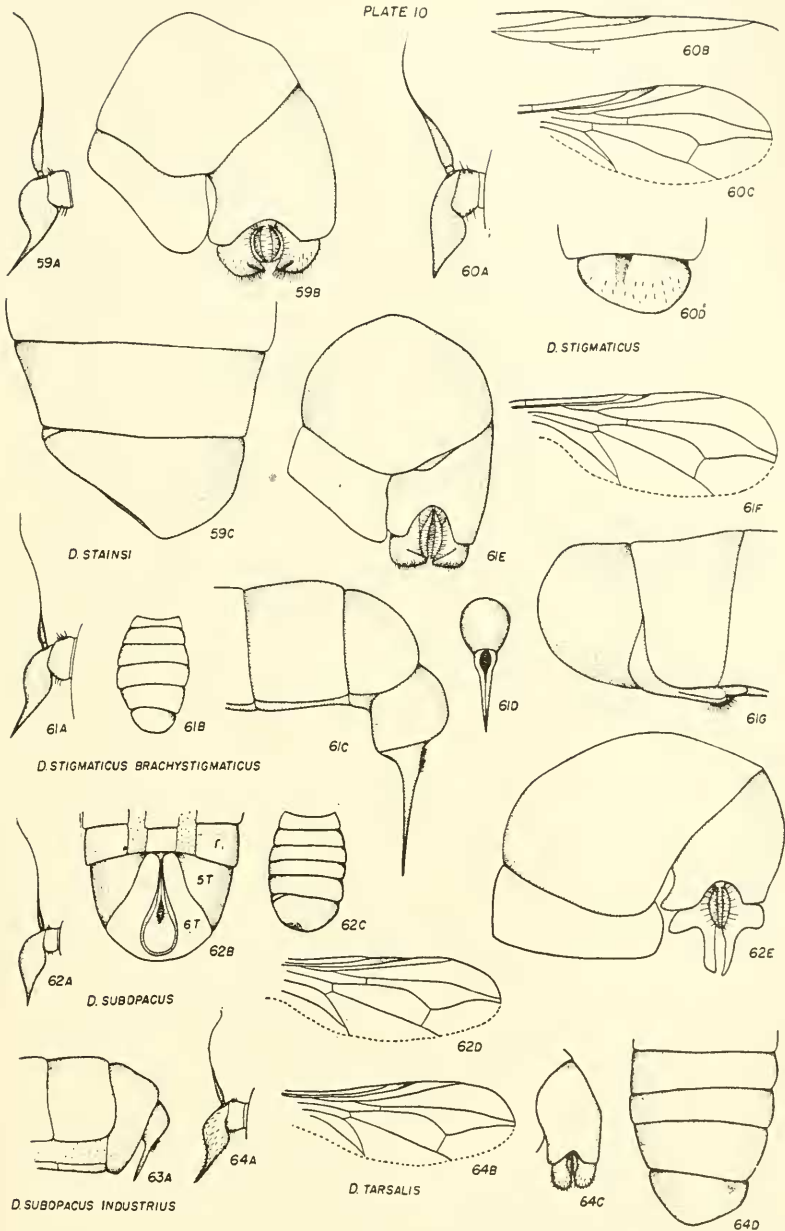


PLATE XI

FIG. 65. *D. trichaetus* (Malloch). a. antenna; b. wing; c. female ovipositor, dorsal; d. ovipositor, lateral.

FIG. 66. *D. varius* (Cresson). a. antenna; b. ovipositor, lateral; c. male hypopygium, dorsal; d. hypopygium, ventral; e. wing; f. male abdomen, lateral.

FIG. 67. *D. vierecki* (Malloch). a. antenna; b. male hypopygium, lateral; c. ovipositor, lateral; d. wing; e. hypopygium, dorsal; f. hypopygium, ventral.

FIG. 68. *Allomethus brimleyi* n. sp. a. antenna; b. wing; c. male abdomen, dorsal.

FIG. 69. *A. flavicornis* (Williston). a. wing.

FIG. 70. *A. xanthopodus* (Williston). a. wing.

FIG. 71. *Dorylomorpha atramontensis* (Banks). a. male hypopygium, dorsal; b. antenna.

PLATE II

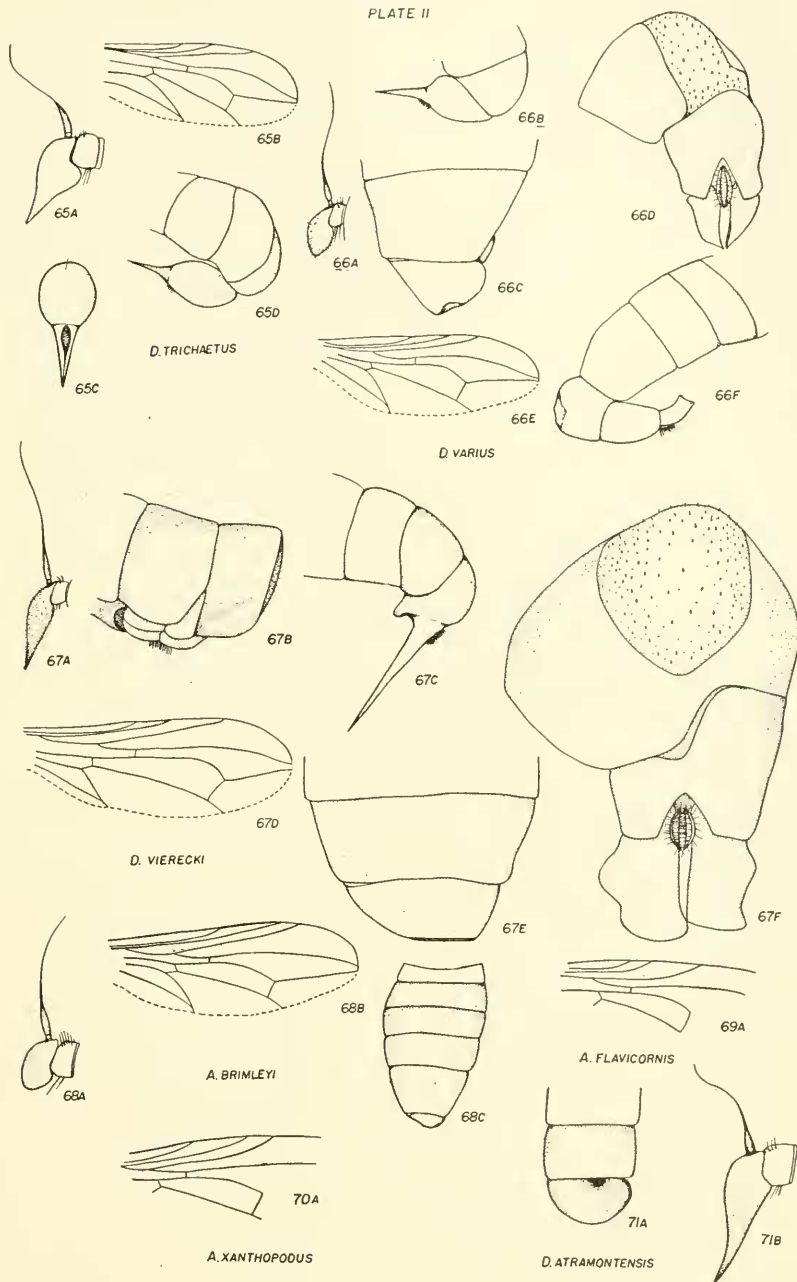


PLATE XII

FIG. 72. *D. canadensis* n. sp. a. antenna; b. sixth and seventh sclerites of male abdomen; c. female ovipositor, dorsal; d. male hypopygium, ventral; e. hypopygium, dorsal; f. ovipositor, lateral.

FIG. 73. *D. caudelli* (Malloch). a. antenna; b. female ovipositor, dorsal; c. male hypopygium, ventral; d. costal margin of wing; e. ovipositor, lateral; f. hypopygium, dorsal; g. male abdomen, lateral.

FIG. 74. *D. exilis* (Malloch). a. antenna; b. female ovipositor, lateral; c. wing; d. male abdomen, dorsal; e. hypopygium, ventral.

FIG. 75. *D. flavomaculata* (Hough). a. antenna; b. wing; c. female abdomen, lateral; d. male hypopygium, ventral; e. hypopygium, dorsal; f. male abdomen, lateral.

PLATE 12

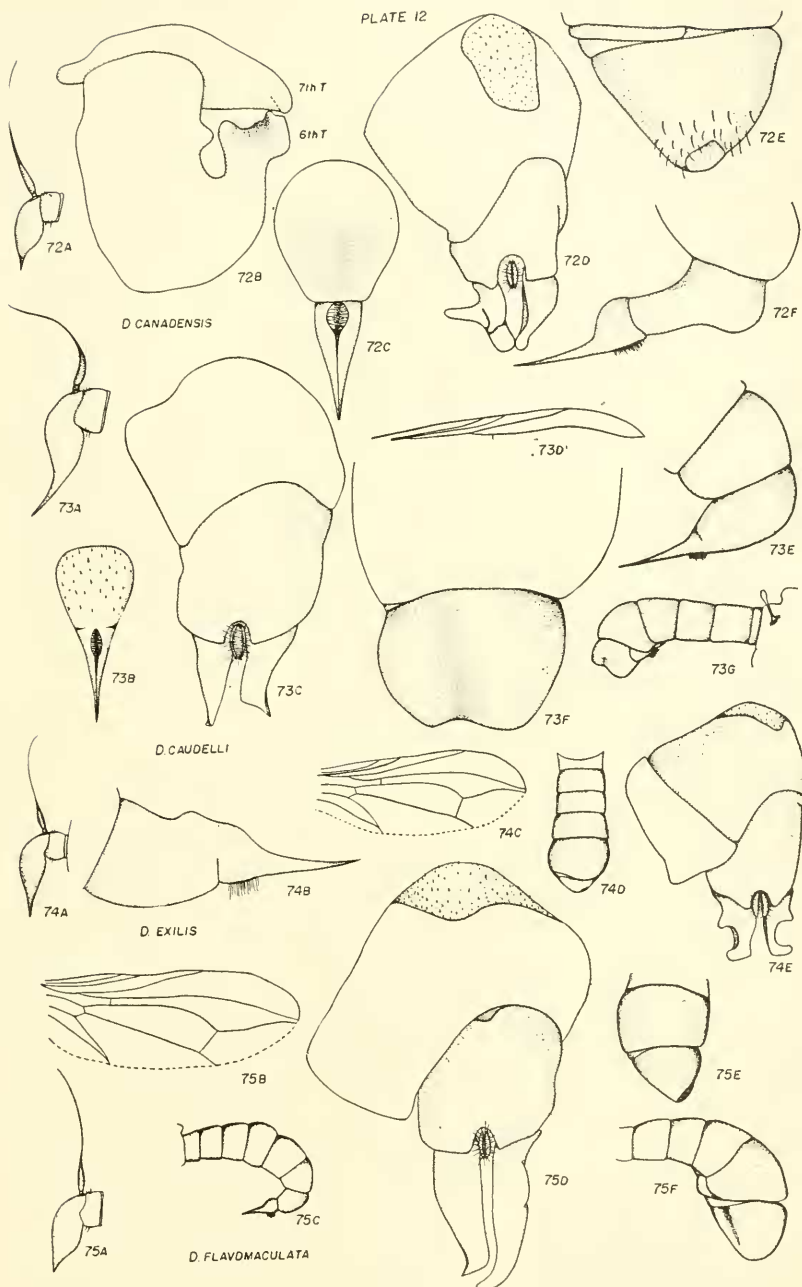


PLATE XIII

FIG. 76. *D. occidents* (Hardy). a. antenna; b. wing; c. male hypopygium, dorsal; d. male abdomen, lateral; e. hypopygium, ventral.

FIG. 77. *D. ornata* n. sp. a. antenna; b. male hypopygium, ventral; c. sixth and seventh sclerites of male abdomen; d. inner harpagone, lateral; e. outer harpagone, lateral; f. female ovipositor, lateral.

FIG. 78. *D. tridentata* n. sp. a. antenna; b. wing; c. male abdomen, lateral; d. hypopygium, ventral; e. female ovipositor, dorsal; f. hypopygium, dorsal; g. sixth and seventh sclerites of male; h. ovipositor, lateral.

FIG. 79. *D. uncinata* n. sp. a. female antenna; b. apex of female wing; c. wing of male; d. female abdomen, lateral.

PLATE 13

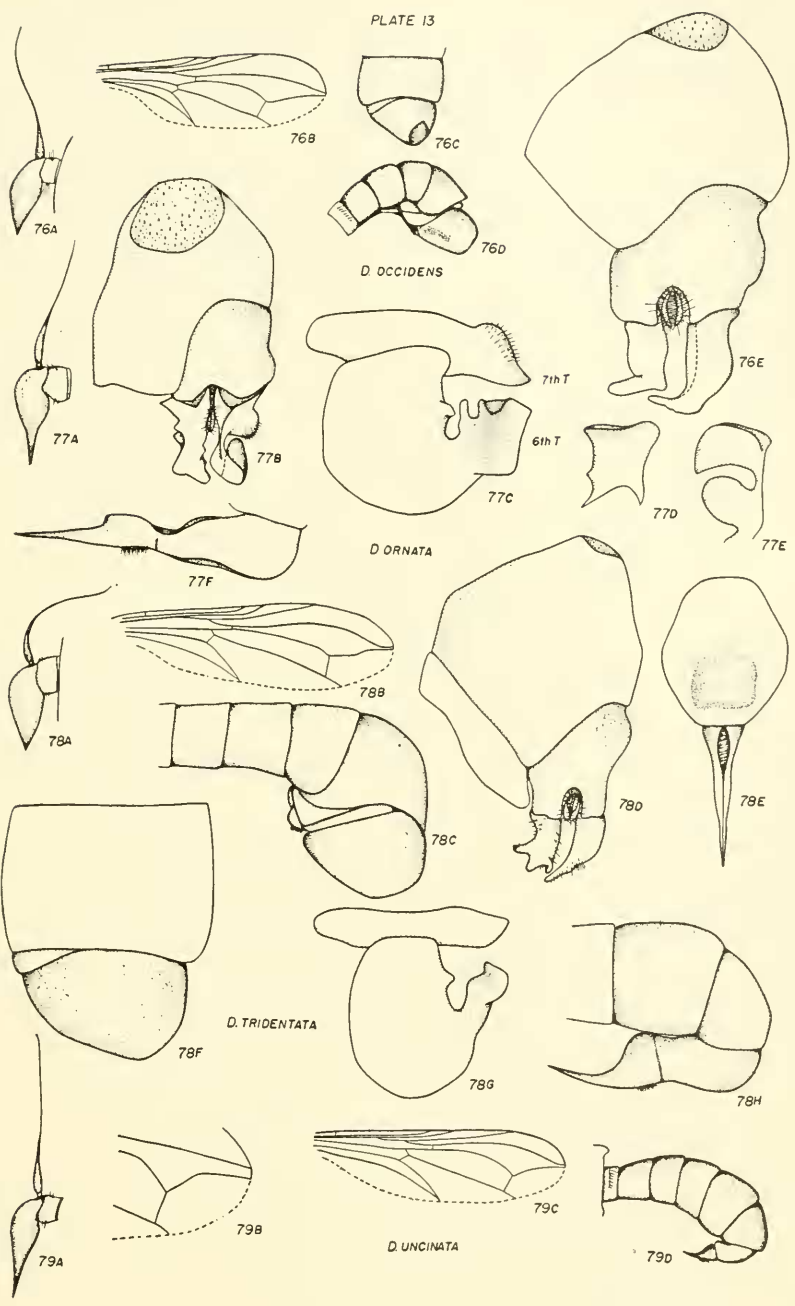


PLATE XIV

FIG. 79. *D. uncinata* n. sp. e. hypopygium dorsal; f. male antenna; g. hypopygium ventral.

FIG. 80. *Tömösváryella agnesea* Hardy. a. front of male; b. male hypopygium, ventral; c. hypopygium, lateral.

FIG. 81. *T. appendipes* (Cresson). a. antenna; b. hind leg of male; c. wing; d. variation of hind trochanter of male; e. male hypopygium, ventral; f. hypopygium, dorsal; g. female abdomen, lateral; h. variation in hind trochanter of male.

FIG. 82. *T. armata* Hardy. a. male hypopygium, ventral; b. posterior trochanter of male.

FIG. 83. *T. beameri* Hardy. a. posterior trochanter of male; b. male hypopygium, ventral.

FIG. 84. *T. bidens* (Cresson). a. antenna; b. wing; c. posterior trochanter of male; d. male hypopygium, dorsal; e. female abdomen, lateral; f. hypopygium, ventral.

PLATE 14

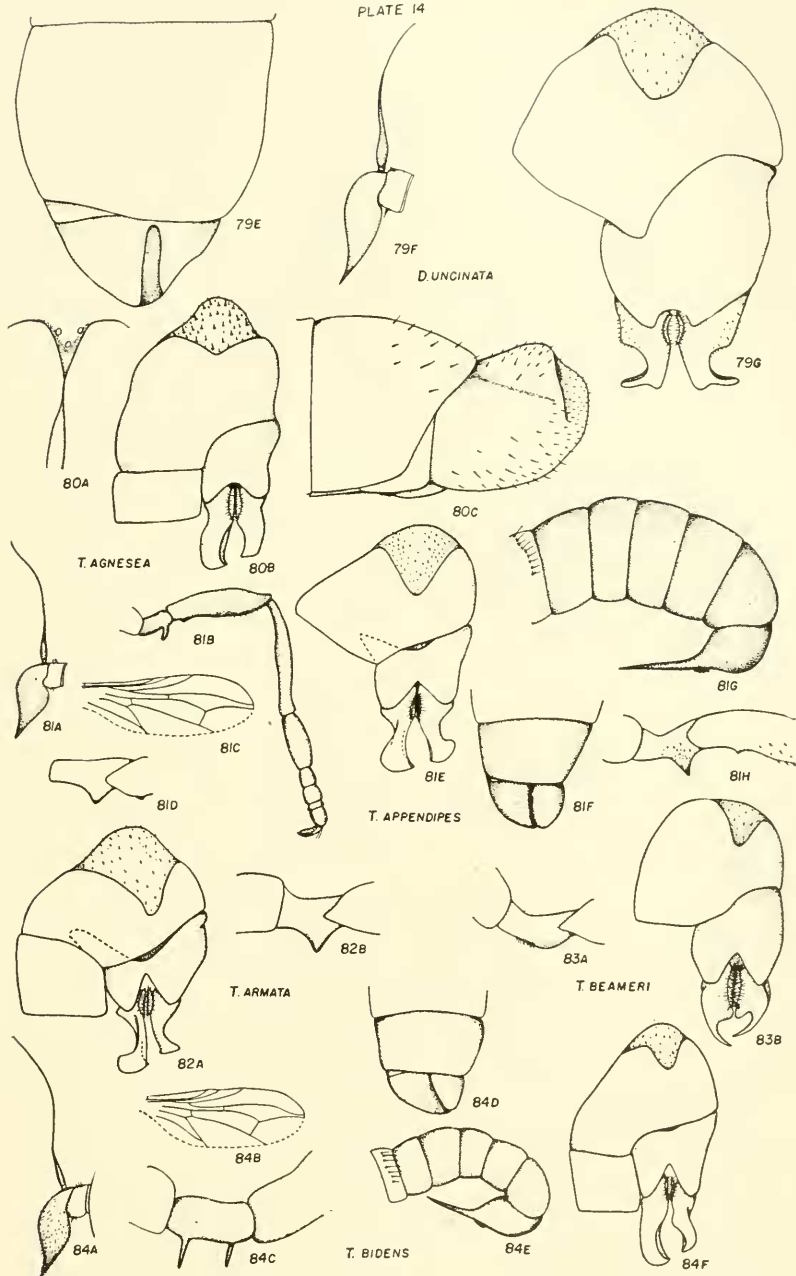


PLATE XV

FIG. 85. *T. brevijuncta* n. sp. a. antenna; b. female abdomen, lateral; c. male hypopygium, dorsal; d. hypopygium, ventral; e. posterior trochanter of male; f. posterior trochanter of female.

FIG. 86. *T. columbiana* (Kertész). a. antenna; b. hind leg of male; c. male hypopygium, lateral; d. hypopygium, dorsal.

FIG. 87. *T. contorta* (Hardy). a. antenna; b. posterior leg of female; c. posterior leg of male; d. male abdomen, dorsal; e. female abdomen, lateral; f. male hypopygium, lateral; g. hypopygium, ventral.

FIG. 88. *T. coquilletti* (Kertész). a. antenna; b. wing; c. male hypopygium, right lateral; d. posterior trochanter of male; e. female abdomen, lateral; f. male hypopygium, ventral; g. hypopygium, dorsal.

FIG. 89. *T. dissimilis* n. sp. a. posterior trochanter of male; b. female ovipositor, lateral view.

PLATE 15

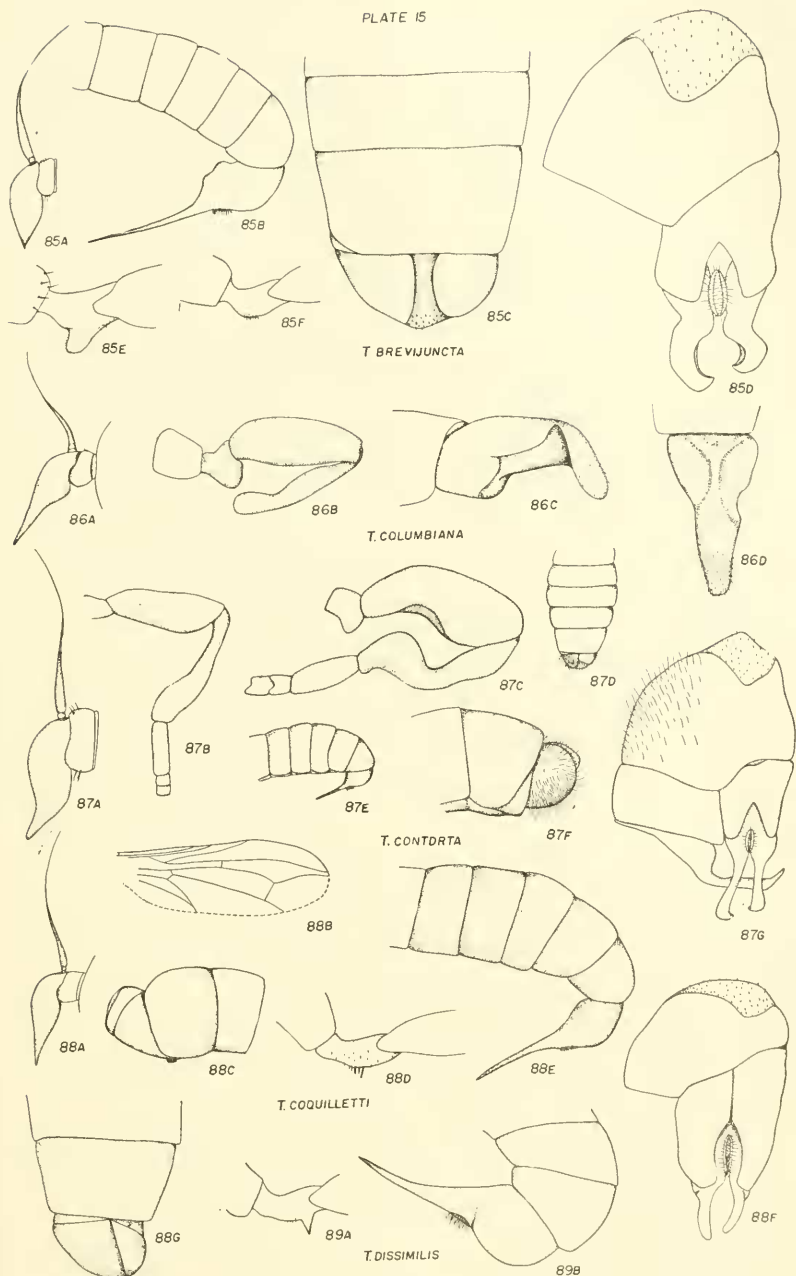


PLATE XVI

FIG. 89. *T. dissimilis* n. sp. c. antenna; d. male hypopygium, ventral; e. hypopygium, dorsal.

FIG. 90. *T. exilidens* n. sp. a. male hypopygium, dorsal; b. hypopygium, ventral; c. female ovipositor, lateral; d. posterior trochanter of male.

FIG. 91. *T. floridensis* (Hardy). a. posterior trochanter of male; b. male hypopygium, dorsal; c. hypopygium, ventral.

FIG. 92. *T. lepidipes* n. sp. a. antenna; b. male hypopygium, dorsal; c. hypopygium, ventral; d. female ovipositor, lateral; e. posterior trochanter of male.

FIG. 93. *T. minacis* Hardy. a. posterior trochanter of male; b. lateral view of outer harpagone; c. harpagones, ventral.

FIG. 94. *T. pauca* n. sp. a. posterior trochanter of male; b. male hypopygium, ventral.

FIG. 95. *T. propinqua* n. sp. a. male hypopygium, dorsal; b. hypopygium, ventral; c. female ovipositor, dorsal; d. posterior trochanter of male.

FIG. 96. *T. quadradentis* n. sp. a. male hypopygium, ventral; b. hypopygium, dorsal.

PLATE 16

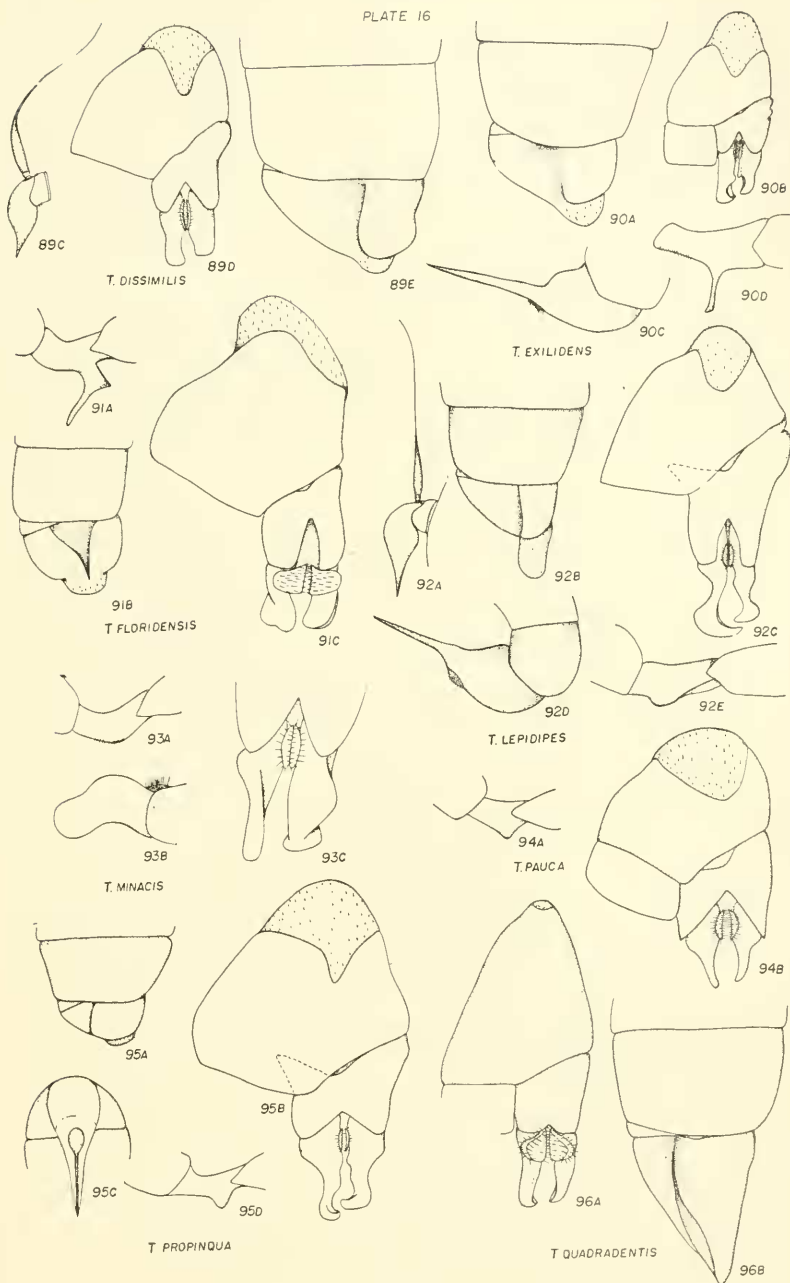


PLATE XVII

FIG. 96. *T. quadridentis* n. sp. c. antenna; d. posterior trochanter of male.

FIG. 97. *T. sachtlebeni* (Aezel). a. antenna; b. wing; c. posterior trochanter of male; d. abdomen of male, dorsal; e. hypopygium, ventral.

FIG. 98. *T. similis* (Hough). a. antenna; b. hypopygium, lateral; c. hypopygium, right lateral with abdomen dissected away; d. hypopygium, ventral; e. abdomen of male, dorsal; f. posterior trochanter of male; g. female ovipositor, lateral; h. front of male.

FIG. 99. *T. sonorensis* (Cole). a. posterior trochanter of male, copied from Cole's fig.

FIG. 100. *T. subnitens* (Cresson). a. antenna; b. male hypopygium, dorsal; c. posterior trochanter of male; d. variation in posterior trochanter of male; e. wing; f. female ovipositor, lateral; g. hypopygium, ventral.

FIG. 101. *T. subvirescens* (Loew). a. posterior trochanter of male; b. male hypopygium, dorsal; c. outer harpagone, lateral; d. inner harpagone, lateral; e. hypopygium, ventral.

FIG. 102. *T. sylvatica* (Meigen). a. antenna; b. male abdomen, lateral; c. posterior trochanter of male; d. hypopygium, dorsal; e. hypopygium, ventral; f. male and female in copula.

PLATE 17

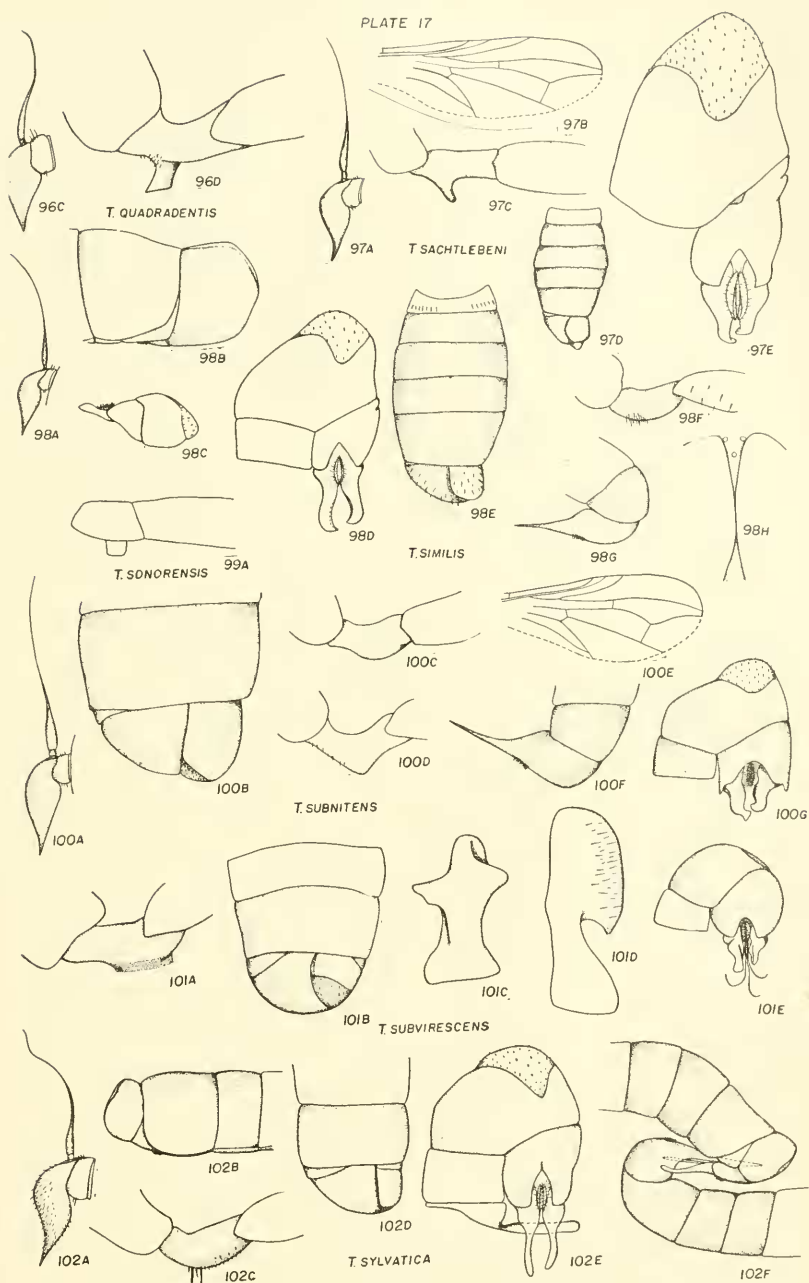


PLATE XVIII

FIG. 103. *T. torodentis* (Hardy-Knowlton). a. male hypopygium, dorsal; b. posterior trochanter of male.

FIG. 104. *T. tumida* Hardy. a. posterior trochanter of male; b. hypopygium, dorsal; c. hypopygium, ventral.

FIG. 105. *T. turgida* Hardy. a. male hypopygium, dorsal; b. posterior trochanter of male; c. hypopygium, ventral.

FIG. 106. *T. utahensis* (Hardy-Knowlton). a. male hypopygium, ventral; b. middle coxa of male, dorsal; c. posterior trochanter of male; d. hypopygium, dorsal.

FIG. 107. *T. vagabunda* (Knab). a. antenna; b. posterior trochanter of male; c. female ovipositor, lateral; d. male abdomen, dorsal; e. hypopygium, ventral.

FIG. 108. *T. wilburi* (Hardy). a. middle coxa of male, lateral; b. mid-coxa, dorsal; c. posterior trochanter of male; d. male hypopygium, ventral; e. hypopygium, dorsal.

FIG. 109. *T. xerophila* n. sp. a. antenna; b. posterior trochanter of male; c. female ovipositor, lateral; d. male hypopygium, dorsal; e. hypopygium, ventral.

PLATE 18

